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Publications--1991

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Adams, Edward L.; Hoff, Kristen G.; Walker, Elizabeth S. 1991. **GR-1ST user's guide**. Gen. Tech. Rep. NE-156.

Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 14 p.

A procedural guide for using the GR-1ST microcomputer system to evaluate different gang-rip-first procedures for processing boards into solid-wood parts. Step-by-step instructions are provided to set up the processing procedure to be evaluated. This procedure is then used to simulate the processing of digitized boards provided by a board-defect data file. The output from the simulated cut-up procedure consists of: (1) parts yield information for individual boards; (2) printer plots of each board, its defects, and the resulting parts; (3) summary tables of surface-area yields and number of parts by part sizes; (4) a data file that can be used to obtain plots of the boards, defects, and parts on a pen plotter; and (5) a data file that can be used with any statistical package to obtain additional information on the parts produced from a group of boards.

Adams, M. B.; Edwards, P. J.; Kochenderfer, J. N. 1991. **Watershed acidification on the Fernow Experimental Forest, West Virginia**. In: 1991 annual meeting of the American Society of Agronomy, Crop Science Society of America, Soil Science Society of America; 1991 October 27-November 1; Denver, CO. Madison, WI: American Society of Agronomy: 345. Abstract.

Adams, M. B.; O'Neill, E. G. 1991. **Effects of ozone and acidic deposition on carbon allocation and mycorrhizal colonization of *Pinus taeda* L. seedlings**. *Forest Science*. 37(1): 5-16.

Patterns of carbon allocation and mycorrhizal colonization were examined in loblolly pine seedlings from two half-sib families exposed to three ozone treatments (charcoal-filtered air, ambient air + 80 ppb O₃, and ambient air + 160 ppb O₃ and three rain pH levels (5.2, 4.5, and 3.3) for 12 weeks in open-topped chambers in a field setting. No statistically significant effects of ozone of rain pH were detected on biomass, root:shoot ratios, or carbon allocation. Concentrations of coarse root starch and mycorrhizal infection varied significantly with ozone levels. No significant interactions among ozone, rain pH, and genotype were detected.

Adams, Mary Beth; Eagar, Christopher. 1993. **Effect of acidic deposition on high-elevation spruce-fir forests in the United States**. In: Longhurst, James W. S., ed.

Acid deposition; origins, impacts and abatement strategies. New York: Springer-Verlag: 75-88.

Large numbers of dead red spruce trees in high-elevation spruce-fir forests of the Eastern United States have been linked with elevated levels of air pollutants. These forests receive a significant amount of sulfate and nitrate from cloudwater deposition. The Spruce-Fir Research Cooperative, an integrated multi-institutional program, is investigating: (1) soil-mediated effects, (2) altered physiological processes, (3) increased foliar injury, and (4) increased susceptibility to winter injury. The results of this research on spruce-fir forests are discussed.

Adams, Mary Beth; Nichols, Dale S.; Federer, C. Anthony; Jensen, Keith F.; Parrott, Harry. 1991. **Screening procedure to evaluate effects of air pollution on Eastern Region wilderness cited as Class I air quality areas**. Gen. Tech. Rep. NE-151. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 33 p.

The USDA Forest Service's Eastern Region manages eight wilderness areas that have been designated as Class I air quality areas by the Federal Clean Air Act. As part of this legislation, federal land managers are required to consult with air-pollution regulators on the potential impacts of proposed air-pollution emissions on the air quality-related values (AQRV) of these wilderness areas. An interim procedure for screening applications for Prevention of Significant Deterioration permits required for Class I areas is discussed, and the AWRV's for the eight Eastern Region wilderness areas are described.

Alegria, James; Scott, Charles T. 1991. **Generalized variance function applications in forestry**. Res. Note NE-345. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

Adequately predicting the sampling errors of tabular data can reduce printing costs by eliminating the need to publish separate sampling-error tables. Two generalized variance functions (GVFs) found in the literature and three GVFs derived for this study were evaluated for their ability to predict the sampling error of tabular forestry estimates. The recommended GVF for most tables is either a GVF which incorporated the sampling errors of the row and column totals or a nonlinear GVF when sampling errors are not published. Tables composed with one sampling intensity and containing data from a multinomial distribution can be represented by a simple linear estimator.

Alves, Luis M.; Simpson, James R.; McPherson, E. Gregory; Mathias, Allen D. 1991. **Microclimatic effects of different landscape treatments on exterior air temperature around similar buildings**. In: 10th conference on biometeorology and aerobiology: special session on hydrometeorology; 1991 September 10-13; Salt Lake City, UT. Boston, MA: American Meteorological Society: 54-57.

Anderson, D. E.; Miller, D. R.; Wallner, W. E. 1991. **Demonstration of the gypsy moth energy budget microclimate model**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech.

- Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 134. Abstract.
- Anderson, D. E.; Miller, D. R.; Wang, Y. S.; Yendol, W. E.; McManus, M. L. 1991. **Micrometeorological measurements during the Blackmo 88 spray trials.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 135. Abstract.
- Anderson, R. Bruce. 1991. **Estimating regional grocery pallet inventory.** Pallet Enterprise. (November/December): 16-20, 65.
A technique for estimating the quantity of grocery pallets required nationally in 1989 is presented. This estimate can be broken down between regions on the basis of volume of grocery retail sales in each region. Requirements for grocery pallets for 53 market areas in seven regions in the United States are given.
- Anderson, R. Bruce. 1991. **Pallet use in grocery distribution affects forest resource consumption location: a spatial model of grocery pallet use.** Res. Pap. NE-651. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5 p.
To assess the impact of grocery pallet production on future hardwood resources, better information is needed on the current use of reusable pallets by the grocery and related products industry. A spatial model of pallet use in the grocery distribution system that identifies the locational aspects of grocery pallet production and distribution determines how these aspects influence the demand and supply of grocery pallets, and assesses the overall impact of grocery pallet consumption on the forest resource is described. Also presented is a method for estimating the overall quantity of new grocery pallet consumption by grocery distribution centers.
- Anderson, R. Bruce; Wisdom, Harold W. 1991. **Wood pallet inventory estimation for the grocery distribution system.** Forest Products Journal. 41(4): 19-24.
A stock adjustment model was tested for its accuracy in estimating the quantity of wood pallets in use in the grocery industry. The grocery pallet, or 48 by 40 GMA as it is known in the industry, represents an inventory investment of more than \$700 million by the grocery distribution industry. Pallets in this inventory have a reported average life of less than 2 years and therefore must be replaced on a regular basis. The changing needs of the grocery industry require that the volume and distribution of grocery pallet inventories be identified more explicitly than in the past. The stock adjustment model provided a consistent estimate of pallet inventory. The model also provides a new approach to estimating the market requirements for new grocery pallets on a national level.
- Armstrong, James P.; Ponzurick, Thomas G.; Luppold, William G. 1991. **United States hardwood exports to Canada.** In: Competing for today's world markets: FPRS 45th annual meeting; 1991 June 23-26; New Orleans, LA. Madison, WI: Forests Products Research Society: 45. Abstract.
- Arner, Stanford L.; Gansner, David A.; Dale, Martin E.; Smith, H. Clay. 1991. **Silvicultural cutting opportunities in oak-hickory forests of West Virginia.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 360-372.
Analysis of cutting opportunities on oak-hickory forests of West Virginia reveals a storehouse of economic opportunity. The potential cut from silviculturally sound thinning, regeneration, and harvest opportunities totals 100 million cords, or 60 times the current annual harvest of growing-stock volume from the state. On the stump, the conversion value of this material totals \$2.4 billion. Moreover, the good housekeeping associated with this silviculture would improve timber productivity and quality.
- Baranchikov, Yuri N.; Mattson, William J.; Hain, Fred P.; Payne, Thomas L., eds. 1991. **Forest insect guilds: patterns of interaction with host trees;** 1989 August 13-17; Abakan, Siberia, U.S.S.R. Gen. Tech. Rep. NE-153. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 400 p.
Twenty-five papers and 19 posters on the interactions of different forest insect guilds with their host plants were presented at this International Union of Forestry Research Organization symposium held in Abakan, Siberia.
- Barger, Jack H.; Hall, Richard W. 1991. **Elm leaf beetle foliage consumption and fecundity on ozone-treated elms.** In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 43-47.
- Bauer, L. S.; McManus, M.; Maddox, J. 1991. **Interactions between nuclear polyhedrosis virus and *Nosema* sp. infecting gypsy moth.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 76. Abstract.
- Baumgras, John E.; LeDoux, Chris B. 1991. **Evaluating timber harvesting and utilization options to maximize harvesting revenue.** In: McNeel, J. F.; Andersson, Bjorn, eds. Forestry operations in the 1990's; challenges and solutions: proceedings of the 14th annual meeting of the Council on Forest Engineering; 1991 July 22-25; Nanaimo, BC. [Place of publication unknown]: [Publisher name unknown]: 22-29.
Demonstrates the application of harvesting-system simulation for the economic analysis of harvesting and utilization alternatives, and illustrates the nature of the

relationships among these alternatives, product prices, and net revenue.

Baumgras, John E.; LeDoux, Chris B. 1991. **Integrating forest growth and harvesting cost models to improve forest management planning.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 120-131.

Two methods of estimating harvesting revenue, reported stumpage prices and delivered prices minus estimated harvesting and haul costs, were compared by estimating entry cash flows and rotation net present value for three simulated even-age forest-management options that included thinning over a 90-year rotation. Revenue estimates derived from stumpage prices indicated that all thinnings were economically feasible and that net present value was maximized by initiating thinning at age 40. Revenue estimates derived from estimated harvesting costs and delivered prices revealed that thinning at age 40 yielded the lowest net present value due to high harvesting costs and negative first-entry cash flows. Stumpage-based revenue estimates also were unstable and highly dependent on the sawtimber-utilization assumptions of the economic analysis.

Beckjord, Peter R.; Melhuish, John H., Jr.; Willis, Raymond B. 1991. **Preliminary spacing trials of *Paulownia tomentosa*.** Tree Planters' Notes. 42(1): 34-35.

An unreplicated spacing trial of *Paulownia tomentosa* (Thunb.) Sieb. & Zucc. ex Steud. demonstrated increased tree growth at high planting densities, probably due to decreased weed growth and increased availability of moisture.

Beckjord, Peter R.; Melhuish, John H., Jr. 1991. **Mycorrhizal responses of *Paulownia tomentosa* to inoculation by different fungal species and isolates.** Transactions of the Kentucky Academy of Science. 42(3-4): 101-104.

Paulownia tomentosa, a shade-intolerant naturalized species, grows in open and disturbed areas. This pioneering capability could be supported in part with infection by a number of mycorrhizal fungi. Ten of twelve mycorrhizal fungi species and/or isolates tested infected *Paulownia* seedlings. Infection ranged from very poor by *Glomus intraradices* (isolate Shenck) and *Gigaspora gregaria* to excellent by *Glomus intraradices* (isolate Ames) and *Globus epigaeum*. Seedling-shoot dry weights were not significantly different among inoculation treatments; however, stem heights and root dry weights varied significantly.

Berisford, C. Wayne; Lanigan, Todd J.; Montgomery, Michael E. 1991. **Performance of gypsy moth larvae on hosts from the deep South: survival, development and host preferences.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 48. Abstract.

Brock, Samuel M.; Zinn, Gary W.; Dempsey, Gilbert P. 1991. **Location requirements of technologically advanced cabinet firms.** Circ. 154. Morgantown, WV. Morgantown, WV: West Virginia University, Agricultural and Forestry Experiment Station: 1-9.

Although the central Appalachian region has abundant raw material and labor resources, the wood cabinet industry there is relatively underdeveloped. Development would bring sorely needed jobs and income. The outlook for the future of the industry at the national level is highly favorable. The market for cabinets is expected to increase from \$6 billion in 1990 to \$9 billion by the year 2000. Development officials need to know what factors are important to the industry when making decisions on location. Cabinet firms, especially large multi-plant concerns, are introducing advanced technology such as computerized manufacturing and design. Developers need to determine whether such technology has special locational requirements for service and maintenance of equipment and for skill levels of the labor force.

Brooks, Robert T.; Millers, Imants; Dickson, David R. 1991. **Forest health monitoring in the United States: the 1990 experience in New England.** In: IUFRO workshop on monitoring air pollution impact on permanent sample plots, data processing and results interpretation; 1991 September 2-6; Prachaticce, Czechoslovakia. Prague, Czechoslovakia: Forestry and Game Management Research Institute: 12-21.

Forest health monitoring (FHM) is a long-term effort with a major emphasis on detecting unexpected changes from baseline forest conditions or from established or expected trends. Three goals have been specified for FHM: detect changes, evaluate possible causes of change, and increase ability to anticipate or predict change based on an improved understanding of forest-ecosystem processes.

Brooks, Robert T.; Miller-Weeks, Margaret; Burkman, William. 1991. **Forest health monitoring, New England, 1990: summary report.** NE-INF-94-91. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 9 p.

The objectives of the 1990 forest health monitoring field season were the establishment of the permanent plot network and the collection of first-year data on crown rating and growth. These baseline data will be used to identify changes in subsequent years.

Burns, Denver P. 1991. **Introduction.** In: Burns, Denver P., tech. coord. Research management for the future; 1990 August 5-11; Montreal, PQ. Gen. Tech. Rep. NE-157. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 1.

Burns, Denver P. 1991. **Research's hidden assets—tapping into employee knowledge and experience.** In: Burns, Denver P., tech. coord. Research management for the future; 1990 August 5-11; Montreal, PQ. Gen. Tech. Rep. NE-157. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 45-54.

The USDA Forest Service is an old-line organization created in 1905. Like all organizations, the Forest Service has accumulated procedures and processes and ingrained patterns of behavior over time. Several approaches have been attempted to increase the organization's efficiency and effectiveness. A program designed to empower employees and managers to reduce bureaucratic red tape and promote efficiency and effectiveness was tested. Some results of that program are discussed.

Burns, Denver P., tech. coord. 1991. **Research management for the future**. Gen. Tech. Rep. NE-157. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 143 p. Includes technical papers delivered at the 19th World Congress of the International Union of Forestry Research Organizations held in 1990 in Montreal, Canada.

Burton, Andrew J.; Pregitzer, Kurt S.; Reed, David D. 1991. **Leaf area and foliar biomass relationships in northern hardwood forests located along an 800 km acid deposition gradient**. *Forest Science*. 37(4): 1041-1059.

Cannon, W. N., Jr.; Barger, J. H. 1991. **White oak-gypsy moth response to ozone**. In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 35. Abstract.

Carter, M. R.; Ravlin, F. W.; McManus, M. L. 1991. **Changes in gypsy moth (*Lepidoptera: Lymantrilidae*) fecundity and male wing length resulting from defoliation**. *Journal of Environmental Entomology*. 20(4): 1042-1047.

Carter, M. R.; Ravlin, F. W.; McManus, M. L. 1991. **Leading edge gypsy moth population dynamics**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 49. Abstract.

Colbert, J. J. 1991. **History of research on modeling gypsy moth population ecology**. In: Gottschalk, Kurt W.; Twery, Mark J.; Smith, Shirley I., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 98-110.

The history of research to develop models of gypsy moth population dynamics and some related studies are described. Empirical regression-based models are reviewed and the more comprehensive process models are discussed. Current model-related research efforts are introduced. Software that models the life system of gypsy moth is described. The Gypsy Moth Life System Model is designed to simulate the dynamics and interactions of gypsy moth, its hosts and natural enemies, in a forest stand over a number of years, with or without human intervention.

Colbert, J. J.; Racin, G. E. 1991. **Gypsy moth life system model**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 136. Abstract.

Colbert, J. J.; Rumei, Xu. 1991. **Behavior of the gypsy moth life system model and development of synoptic model formulations**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 116. Abstract.

Corbett, Edward S. 1991. **Gypsy moth defoliation impacts on water quality and quantity**. In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 31. Abstract.

Dale, V. H.; Gardner, R. H.; DeAngelis, D. L.; Eagar, C. C.; Webb, J. W. 1991. **Elevation-mediated effects of balsam woolly adelgid on southern Appalachian spruce-fir forests**. *Canadian Journal of Forest Research*. 21(11): 1639-1648.

Davidson, Walter H. 1991. **Performance of spot-seeded oaks and walnut on an eastern Kentucky minesoil**. *International Journal of Surface Mining and Reclamation*. 5: 163-165.

Describes the effects of mulch, fertilizer, and grasses and legumes on the survival and growth of four species of spot-seeded oak and walnut after 10 growing seasons.

Davidson, Walter H.; Pollio, Carol A. 1991. **Woody species establishment from a forest soil seed bank in West Virginia**. In: Oaks, Wendall; Bowden, Joe, eds. Proceedings of the 1991 national meeting of the American Society of Surface Mining and Reclamation; 1991 May 14-17; Durango, CO. Princeton, WV: American Society of Surface Mining and Reclamation: 625-629.

DeBald, Paul S.; Dale, Martin E. 1991. **Tree value conversion standards revisited**. Res. Pap. NE-645. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 28 p. Updated tree value conversion standards (TVCS) are presented for 12 important hardwood species of the oak-hickory forest. These updated standards--developed for each species by butt-log grade, merchantable height, and diameter at breast height--reflect the changes in lumber prices and in conversion costs that have occurred since 1976 when the original TVCS were published.

deCalesta, David S. 1991. **Modification of the standard deer pellet group technique**. In: Majumdar, Shyamal K., ed. 67th annual meeting of the Pennsylvania Academy of

Science; 1991 April 19-21; Wyomissing, PA. Philadelphia, PA: Pennsylvania Academy of Science: 187.

The technique of counting deer pellets (for calculation of deer density) uses counts of pellets detected within plots or belts along parallel line transects. The counts start at one transect line, then travel to adjacent parallel transect lines. Counters finish a considerable distance from the starting point. Time also is lost traveling between transect lines. We devised a modification whereby transect lines are laid out in an "X". Each arm of the "X" is one-half mile long. The ends of two arms of the X in one quadrant are connected by a line, as are those in the opposing quadrant. Counts of pellet groups begin in the center of the X and trace the pattern of the X with the two connecting lines.

DeGraaf, Richard M. 1991. **Breeding bird assemblages in managed northern hardwood forests in New England.** In: Rodiek, Jon E.; Bolen, Eric G., eds. *Wildlife and habitats in managed landscapes.* Washington, DC: Island Press: 153-171.

Describes changes that occur in bird species composition as stands of northern hardwoods develop after clearcutting in northern New England; this is an example of the changes that occur in one habitat type in the landscape mosaic. Breeding bird compositions associated with different habitats within the northern hardwood type are included, as are some habitat-management guidelines to enhance bird species richness in managed stands and for the landscape as a whole.

DeGraaf, Richard M. 1991. **Winter foraging guild structure and habitat associations in suburban bird communities.** *Landscape and Urban Planning.* 21: 173-180.

DeGraaf, Richard M.; Geis, Alfred D.; Healy, Patricia A. 1991. **Bird population and habitat surveys in urban areas.** *Landscape and Urban Planning.* 21: 181-188. Breeding bird populations in six habitats in Columbia, Maryland, were studied to develop procedures suitable for measuring bird use of residential areas and to identify habitat characteristics that define the distribution of various common bird species. A procedure to measure bird use based on 4-minute transect counts on plots measuring 91 by 91 m proved more effective than point counts. Transect counts reduced many of the problems associated with counting birds in urban areas, such as varying noise and visibility. Eighty percent of observations were recorded in the first 4 minutes.

DeGraaf, Richard M.; Healy, William M.; Brooks, Robert T. 1991. **Effects of thinning and deer browsing on breeding birds in New England oak woodlands.** *Forest Ecology and Management.* 41: 179-191.

Over a 3-year period we compared the effects of forest thinning and white-tailed deer browsing on breeding birds in central Massachusetts oak forests across 12 stands with dominant trees having a d.b.h. greater than 27.9 cm. Unthinned stands with few deer had moderately dense woody understories and moderate ground cover; unthinned stands with many deer had sparse woody understories and little ground cover. Thinned stands with few deer had dense,

tall woody understories and moderate ground cover, and thinned stands with many deer had sparse woody understories and lush ground cover. Understory changes associated with high deer densities apparently were offset by effects of thinning so that thinned stands supported more breeding bird species. We recorded 65 species of birds; 28 were found in all treatment classes.

DeGraaf, Richard M.; Scott, Virgil E.; Hamre, R. H.; Ernst, Liz; Anderson, Stanley H. 1991. **Forest and rangeland birds of the United States: natural history and habitat use.** *Agric. Handb. 688.* Washington, DC: U.S. Department of Agriculture. 625 p.

Provides managers with information on the assemblage of bird species that might be expected in forest and rangeland habitats.

DeGraaf, Richard M.; Snyder, Dana P.; Hill, Barbara J. 1991. **Small mammal habitat associations in poletimber and sawtimber stands of four forest cover types.** *Forest Ecology and Management.* 46(3-4): 227-242.

Dempsey, Gilbert P. 1991. **The wooden box industry in the 80's.** *Pallet Enterprise.* 11(4): 32,34,36.

Outlines some of the more important changes in wooden box and shook output in the 1980's, and analyzes associated shifts in two of the industry's primary operating factors--investments in labor and capital.

Dempsey, Gilbert P.; Martens, David G. 1991. **The pallet industry: a changing hardwood market.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. *Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148.* Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 550-555.

From its inception during World War II, the wooden pallet industry has grown to become the nation's largest industrial consumer of hardwood lumber products. Since most of the raw material in wooden pallets is lower grade lumber, the pallet industry's growth, efficiency, and changing input of raw material must be of concern to the grade hardwood lumber industry, the fine hardwood lumber-using sectors, and hardwood resource investors and managers.

Dennis, Donald F. 1991. **A censored regression approach to modeling harvest behavior.** In: Buford, Marilyn A., comp. *Proceedings of the 1991 symposium of systems analysis in forest resources; 1991 March 3-6; Charleston, SC. Gen. Tech. Rep. SE-74.* Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 348-354.

Provides insight into private-sector timber supply through development of both theoretical and empirical models of harvest behavior. A microeconomic model is used to examine the harvest decision for owners who value both forest amenities and monetary income. Results of censored regression (Tobit) analyses highlight the influence of landowner affluence and certain forest characteristics on harvesting. Decomposition of the Tobit coefficients indicates that changes in timber supply are expected to occur primarily at the extensive rather than intensive margin.

- Dennis, Donald F. 1991. **Estimating timber supply from private forests.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 519-534.
- Dennis, D. F.; Sendak, P. E. 1991. **Factors influencing involvement of a forester in managing non-industrial forests.** Journal of Environmental Management. 33: 169-173.
- Dennis, Donald F.; Sendak, Paul E. 1991. **An alternate property tax program requiring a forest management plan and scheduled harvesting.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 15-22.
- Vermont's Use Value Appraisal property tax program, designed to address problems such as tax inequity and forced development caused by taxing agricultural and forest land based on speculative values, requires a forest management plan and scheduled harvests. A probit analysis of enrollment provides evidence of the program's success in attracting large parcels of undeveloped land, in providing financial relief in areas where taxes are most burdensome, and in encouraging more affluent landowners to harvest timber.
- Dennis, Donald F.; Sendak, Paul E. 1991. **Hardwood stumpage price trends in New England.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 582. Abstract.
- Dennis, Donald F.; Sendak, Paul E. 1991. **Which landowners use professional foresters?** Consultant. 36(4): 10,12.
- Donnelly, John R.; Shane, John B.; Yawney, Harry W. 1991. **Harvesting causes only minor changes in physical properties of an upland Vermont soil.** Northern Journal of Applied Forestry. 8(1): 33-36.
- Bulk density, oxygen, and temperature of a northern hardwood forest soil in Vermont were measured immediately before and for 2 years following harvesting using conventional clearcut and whole-tree methods. Bulk density increased as a result of harvesting but there was no difference between the two harvest methods. Increases were relatively small, and essentially disappeared within 2 years. Soil oxygen never was significantly affected by treatment. Soils in uncut plots were warmer in winter and cooler in summer than those of either harvest area, but these differences appear to be diminishing with the establishment of vegetation on the harvested plots.
- Donnelly, John R.; Shane, John B.; Yawney, Harry W. 1991. **Harvesting causes only minor changes in physical properties of an upland Vermont soil.** Journal of Forestry. 89(7): 28-31.
- Dougherty, Edward M.; Guzo, David; Shields, Kathleen S.; Lynn, Dwight E.; Braun, Susan K. 1991. **Autographa californica nuclear polyhedrosis virus replication in non-permissive Lymantria dispar cell lines.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 55. Abstract.
- Dubey, T.; Stephenson, S. L.; Edwards, P. J. 1991. **A preliminary study of the mycoflora of West Virginia mountain streams.** Mycological Society of America Newsletter. 42: 12. Abstract.
- Dubois, Normand R. 1991. **Current research efforts with Bacillus thuringiensis.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 78. Abstract.
- Dubois, Normand R.; Barger, Jack H. 1991. **Effects of simulated acid rain on Bacillus thuringiensis residual against gypsy moth, New Haven County, Connecticut, 1990.** Insecticide & Acaricide Tests: 1991. 16(14H): 273-274.
- Dubois, N. R.; Dean, D. H.; Wolfersberger, M. G. 1991. **Larvicidal activity against the gypsy moth, Lymantria dispar L., of the insecticidal Crystal Proteins (ICPs) encoded by the cryIA genes of Bacillus thuringiensis spores.** In: 24th annual meeting, Society for Invertebrate Pathology; 1991 August 4-6; Flagstaff, AZ. [Place of publication unknown]: [Publisher name unknown]. Abstract.
- Dubois, Normand R.; Reardon, Richard; Mierzejewski, Karl; McLane, Winfred; Witcosky, Jeffrey R. 1991. **Field efficacy of Bacillus thuringiensis Foray 48B® and Thuricide 48LV® when applied against young, (instar I-II) and older (instar III-IV), gypsy moth larval infestations.** In: Proceedings of the national gypsy moth review; 1991 November 4-7; Raleigh, NC. Raleigh, NC: National Gypsy Moth Management Board: 129-132.
- Echelberger, Herbert E.; Luloff, Albert E.; Schmidt, Frederick E. 1991. **Northern forest lands: resident attitudes and resource use.** Res. Pap. NE-653. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 26 p.
- Describes socioeconomic characteristics of residents of northern New Hampshire and northeastern Vermont; their level of participation in outdoor recreational activities; perceptions of community problems; and attitudes concerning local versus regional planning, public ownership of northern forest lands, and other pertinent issues with respect to changes in patterns of land ownership that are

potentially significant. Responses by state and by size of respondents' communities are compared.

Echelberger, Herbert E.; Thomas, Kristine E. 1991. **Cross-country skiing's contribution to enhanced rural living.** In: Zeigler, Joanne F., ed. Proceedings of a national policy symposium: enhancing rural economics through amenity resources; 1990 May 1-5; State College, PA. State College, PA: Pennsylvania State University: 99-104.

Edwards, Pamela J.; Helvey, J. David. 1991. **Long-term ionic increases from a Central Appalachian forested watershed.** *Journal of Environmental Quality*. 20(1): 250-255.

Edwards, Pamela J.; Kochenderfer, James N.; Seegrist, Donald W. 1991. **Effects of forest fertilization on stream water chemistry in the Appalachians.** *Water Resources Bulletin*. 27(2): 265-274.

Stream water chemistry was monitored on two watersheds on the Fernow Experimental Forest in north-central West Virginia to determine the effects of forest fertilization on annual nutrient exports. Ammonium nitrate and triple superphosphate were applied simultaneously at rates of 336 kg ha⁻¹ N and 224 kg ha⁻¹ P₂O₅, respectively, which are similar to rates used in commercial forest operations. The treatment significantly increased outputs of several ions. Annual outputs of nitrate N increased as much as 18 times over pretreatment levels, and calcium and magnesium increased as much as three times over pretreatment levels the first year after fertilization. Outputs for these nutrients were elevated for all three posttreatment years.

Edwards, Pamela J.; Wood, Frederica; Kochenderfer, James N. 1991. **Characterization of ozone during consecutive drought and wet years at a rural West Virginia site.** *Journal of Air Waste Management Association*. 41(11): 1450-1453.

Ozone concentrations at a rural-remote site in a forested region of north-central West Virginia were monitored during 1988 and 1989, a drought and wet year, respectively. During 1988, the absolute maximum average concentration for a single hour was 156 ppb; in 1989 it was only 107 ppb. Overall, the frequency of high concentrations was greater during 1988; the National Ambient Air Quality Standard of 120 ppb was exceeded 17 times. The 7-hour period encompassing the highest growing-season concentrations for this site over the 2-year period is 1100-1759 EST rather than 0900-1559 originally used by the National Crop Loss Assessment Network. The 7-hour growing-season means (0900-1559) of 52.6 ppb and 47.1 ppb for 1988 and 1989, respectively, compare well to those reported for the Piedmont/Mountain/Ridge-Valley area, but are higher than those for surrounding areas. Diurnal ozone patterns and the distribution of concentration ranges and timing of seasonal maxima suggest that long-range transport of ozone and its precursors probably is an important factor at this site.

Elkinton, Joseph S.; McManus, Michael L. 1991. **Development of a pheromone-baited trap to monitor gypsy moth populations.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth

research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 111. Abstract.

Elkinton, Joseph S.; Smith, Harvey R.; Liebhold, Andrew M. 1991. **Impact of small mammal predators on gypsy moth.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 46. Abstract.

Elmes, Gregory A.; Fugikawa, Edward K.; Twery, Mark J. 1991. **Forest cover type estimation from digital elevation data.** In: Proceedings of the 11th annual ESRI user conference. Redlands, CA: Environmental Systems Research Institute: 389-395.

Because data on forest species composition are difficult to obtain for large areas, it often is unavailable for GIS-based analysis in forest resource management. Digital elevation model (DEM) data along with other pertinent information are interpreted in a GIS using a knowledge-based framework to construct "most likely" species composition units. This adds to our ability to study and manage the forest environment.

Erickson, Michael S.; Hassler, Curt C.; LeDoux, Chris B. 1991. **Silvicultural treatments and logging costs for minimizing gypsy moth impacts.** In: 1991 international winter meeting of the American Society of Agricultural Engineers; 1991 December 17-20; Chicago, IL. Pap. 91-7524. St. Joseph, MI: American Society of Agricultural Engineers: 1-15.

Ernst, Richard L.; Stout, Susan L. 1991. **Computerized algorithms for partial cuts.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 132-147.

Stand density, stand structure (diameter distribution), and species composition are changed by intermediate treatments in forest stands. To use computer stand-growth simulators to assess the effects of different treatments on stand growth and development, users must be able to duplicate silviculturally realistic treatments in the simulator. The computer algorithms for partial cuts associated with the FIBER, NE-TWIGS, OAKSIM, SILVAH and YIELD-MS computer programs are reviewed with respect to flexibility, comprehensiveness, and their ability to mimic cuts prescribed in management guides for timber production.

Eshita, Steven M.; Roberto, Nick H. 1991. ***Pseudomonas gladioli* as an antagonist against vascular wilt fungal pathogens.** In: Haissig, Bruce E.; Kirk, T. Kent; Olsen, William L.; Raffa, Kenneth F.; Slavicek, James M., eds. Abstracts of papers presented at the international symposium on applications of biotechnology to tree culture, protection, and utilization. Gen. Tech. Rep. NE-152. Radnor, PA: U.S. Department of Agriculture, Forest

Service, Northeastern Forest Experiment Station: 103. Abstract.

Fleischer, S. J.; Bridges, J. R.; Ravlin, F. W.; Thoeny, W. T. 1991. **Elemental marking in deciduous and coniferous tree systems.** Southwestern Entomologist. (Supplement 14): 49-56.

Forbes, Craig; Punches, John; Sinclair, Steve; Luppold, Bill. 1991. **Wood and wood based material use in the wood furniture industry.** Res. Update. Blacksburg, VA: Virginia Polytechnic Institute and State University, Department of Wood Science and Forest Products. 4 p.

Fosbroke, David E.; Hicks, Ray R., Jr.; Gottschalk, Kurt W. 1991. **Predicting tree mortality following gypsy moth defoliation.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 583-585.

Appropriate application of gypsy moth control strategies requires an accurate prediction of the distribution and intensity of tree mortality prior to defoliation. Such information is necessary to better target investments in control activities where they are needed.

Galford, Jimmy; Auchmoody, L. R.; Smith, H. Clay; Walters, Russell S. 1991. **Insects affecting establishment of northern red oak seedlings in central Pennsylvania.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 271-280.

Studies to evaluate the impact of insects on the establishment of advance oak regeneration in Pennsylvania were initiated in 1989. The populations and species of insects feeding on germinating acorns and new seedlings, their activity periods, and the damage caused by these insects were studied in relation to overstory density (40, 60, and 100 percent relative density) and understory vegetation control (herbicide and unherbicide) at three sites on the unglaciated Allegheny Plateau in Clearfield County. These experiments showed that overstory-density levels and treatment with herbicide to eliminate the understory had negligible effects on the species of acorn-feeding insects present, their population levels, and the damage to germinating red oak acorns and new seedlings.

Galford, Jimmy R.; Weiss-Cottrill, Deloris. 1991. **Response of insects to damaged and undamaged germinating acorns.** Res. Pap. NE-656. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 3 p.

Damaged germinating northern red oak acorns in pitfall traps were significantly more attractive to two species of acorn insects than undamaged germinating acorns. Significantly more adults of the weevil *Conotrachelus posticus* Boheman and the sap beetle *Stelidota octomaculata* (Say)

were caught in traps containing germinating acorns cut into halves than in traps containing uncut germinating acorns. Larvae of the acorn moth *Valentia glandulella* (Riley) also preferred damaged over undamaged acorns.

Galford, Jimmy R.; Williams, Roger N.; Daugherty, Ann. 1991. **Life history and notes on the biology of *Stelidota octomaculata* (Coleoptera: Nitidulidae).** Res. Pap. NE-644. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7 p.

The life history of *Stelidota octomaculata* (Say) was studied in Ohio and Pennsylvania. This insect damages acorns and affects the establishment of oak seedlings. Acorns deployed in wire cages and pitfall traps plus a sampling of naturally occurring acorns were used to monitor insect activity. Adults overwinter in forest litter and begin feeding on undamaged germinating or damaged acorns in March. Acorns damaged by the beetles may fail to produce seedlings. Beetle reproduction occurs in spring and early summer inside acorns both above and below ground. Reproduction ceases in late July to early August. Adult activity may continue until early December in some years. In the laboratory, a life cycle was completed in about 34 days at 22 degrees to 26 degrees C.

Galford, Jimmy R.; Williams, Roger N.; Beacom, Mary. 1991. **Notes on the biology and hosts of *Stelidota ferruginea* (Coleoptera: Nitidulidae).** Res. Pap. NE-645. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

The nitidulid *Stelidota ferruginea* Reitter was reared from damaged acorns of laurel oak (*Quercus laurifolia* Michx.) and live oak (*Q. virginiana* Mill.) collected in Sarasota County, Florida. This sap beetle has been reared in the laboratory solely on northern red oak (*Q. rubra*) acorns for more than 3 years (27+ generations) and can breed in viable or nonviable acorns. In the laboratory, *S. ferruginea* can develop in the seeds of several species of trees. New information on the biology of *S. ferruginea* is presented.

Gansner, David A.; Amer, Stanford L.; Dale, Martin E.; Smith, H. Clay. 1991. **Reports of demise greatly exaggerated: W. Virginia has major timber potential.** Northern Logger. 40(2): 18-19, 34-35.

Gansner, David A.; Birch, Thomas W.; Lacy, Susan E. 1991. **Northeastern woodlands: hanging in and stocking up.** American Forests. 97(5&6): 48-49, 57.

Despite the nation's most intensive people pressures and land development, forests in the Northeast are gaining in both acres and volume.

Gansner, David A.; Birch, Thomas W.; Sheffield, Raymond M.; McWilliams, William H. 1991. **Central Appalachian hardwoods: getting bigger and stocking up.** National Woodlands. 24(4): 12-15.

Evaluates the state of the hardwood resource in "central Appalachia" defined as all of Pennsylvania, West Virginia, Maryland, and Virginia, the eastern portions of Tennessee and Kentucky, and North Carolina except for Coastal Plain areas.

- Garraway, Michael O.; Huttermann, Aloys; Wargo, Philip M. 1991. **Ontogeny and physiology**. In: Shaw, Charles G., III; Kile, Glen A., eds. *Armillaria* root disease. Agric. Handb. 691. Washington, DC: U.S. Department of Agriculture: 21-47.
Presents information on *Armillaria* structures and their development, nutrition and physiology, and host-parasite interactions.
- Garrett, Peter W., ed. 1991. **Proceedings of a symposium on white pine provenances and breeding**; 1990 August 5-11; Montreal, PQ. Gen. Tech. Rep. NE-155. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 105 p.
Presents technical papers delivered at the 19th World Congress of the International Union of Forestry Research Organizations held in Montreal in 1990.
- Gatchell, Charles J. 1991. **Yield comparisons from floating blade and fixed arbor gang ripsaws when processing boards before and after crook removal**. *Forest Products Journal*. 41(5): 9-17.
Gang-ripping technology that uses a movable (floating) outer blade to eliminate unusable edgings is described. New terminology for identifying preferred and minimally acceptable strip widths is included. Because of the large amount of salvage required to achieve total yields, floating-blade gang ripping is not recommended for boards with crook. With crook removed by crosscutting to shorter, straight pieces, fixed-arbor and floating-blade procedures yielded similar results. Yields from several hundred straight boards also were similar to those for boards with crook removed. No. 1 Common had more yield in the longest lengths than No. 2 Common, but the amount of No. 2 Common lengths were more than sufficient to meet the needs of the furniture and cabinet industries.
- Gentry, Claude E.; Halverson, Howard G.; Wade, Gary L. 1991. **Mass of ions removed by leaching mine spoil with simulated precipitation**. In: Oaks, Wendall; Bowden, Joe, eds. Proceedings of the 1991 national meeting of the American Society of Surface Mining and Reclamation; 1991 May 14-17; Durango, CO. Princeton, WV: American Society of Surface Mining and Reclamation: 87-95.
A pyritic coal mine spoil was leached with simulated precipitation that was adjusted to pH values of 5.6, 5.0, 4.6, 4.2, and 3.8. Each mine-spoil column contained 1500 g of recently dug, extremely acid spoil material. After being brought to field capacity (32 percent by weight) with distilled water, three replicates of spoil were leached weekly using simulated precipitation at each pH level with a volume equivalent to 2.54-cm depth, and leaches were collected and analyzed. Results suggest that fresh spoil contributes readily available ions to groundwater leachate. The pH of incident precipitation significantly affects leaching losses of some elements from mine spoils.
- Gottschalk, Kurt W. 1991. **Gypsy moth impacts on oak acorn production**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 141. Abstract.
- Gottschalk, Kurt W. 1991. **Gypsy moth: impacts and silvicultural options**. In: Laursen, Steven B.; DeBoe, Joyce F., eds. *The oak resource in the upper Midwest: implications for management: conference proceedings*; 1991 June 3-6; Winona, MN. Publ. NR-BU-5663-S. St. Paul, MN: University of Minnesota: 159-169.
Gypsy moth is an introduced insect that defoliates hardwood and conifer trees in several forest types, especially the oak-hickory type. As the insect expands its range, the first-time infestations result in significant mortality and other effects on forests. Subsequent outbreaks, while significant with respect to extensive defoliation and direct effects of defoliation on forest resources, have much smaller effects on tree mortality. Silvicultural treatments can be used to minimize gypsy moth effects on forest stands and to move stands to a condition where they are more resistant to gypsy moth defoliation.
- Gottschalk, Kurt W. 1991. **Gypsy moth: silvicultural options**. *Gypsy Moth News*. 26: 7-9.
- Gottschalk, Kurt W. 1991. **Using silviculture to minimize gypsy moth impacts**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 132. Abstract.
- Gottschalk, Kurt W.; Twery, Mark J.; Smith, Shirley I., eds. 1991. **Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990**; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 152 p.
Includes eight invited papers and 68 abstracts of volunteer presentations on gypsy moth biology, ecology, impacts, and management presented in 1990 at the U.S. Department of Agriculture's interagency gypsy moth research review.
- Gove, Jeffrey H.; Martin, C. Wayne; Patil, Ganapati P.; Solomon, Dale S.; Hornbeck, James W. 1991. **Species diversity on even-aged harvests at the Hubbard Brook experimental forest: ten year results**. In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 29. Abstract.
- Gove, J. H.; Solomon, D. S.; Fairweather, S. E.; Patil, G. P. 1991. **Maximizing the diameter class diversity of uneven-aged northern hardwood stands**. In: Buford, Marilyn A., comp. Proceedings of the 1991 symposium on systems analysis in forest resources; 1991 March 3-6; Charleston, SC. Gen. Tech. Rep. SE-74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 39-45.

Two mathematical programming formulations are presented that allow the determination of diameter distributions that maximize diameter-class diversity in uneven-aged northern hardwood stands. Distributions generated from these models were comparable from a management standpoint and could be incorporated into existing linear programming models as alternative management scenarios.

Griffin, Gary J.; Smith, H. Clay; Dietz, Albert; Elkins, John R. 1991. **Importance of hardwood competition to American chestnut survival, growth, and blight development in forest clearcuts.** Canadian Journal of Botany. 69(8): 1804-1809.

Ten years after clearcutting in forest stands in Virginia and West Virginia, competing hardwoods around American chestnut trees were periodically cut or not cut. Blight epidemics occurred in all clearcut plots prior to their establishment in 1984. For the control plots, the number of chestnut sprout clusters (group of stems sprouting from a single stump) with blighted live stems had decreased by 1989, but between 1985 and 1988 there was a general increase in blighted chestnut stems for the managed clearcut plots. The number of apparent superficial cankers increased in two of three managed plots between 1986 and 1989. Survival of chestnut clusters was high in managed plots between 1985 and 1989, but decreased to zero in one control plot by 1988. Mean diameters at breast height of measurable chestnut stems declined or remained constant in control plots, but generally increased in managed plots after initial declines. Similar but greater responses were observed in a plantation of American chestnut.

Griffith, Michael B.; Perry, Sue A. 1991. **Leaf pack processing in two Appalachian mountain streams draining catchments with different management histories.** Hydrobiologia. 220: 247-254.

Grinberg, P. S.; Wallner, W. E. 1991. **Long-term laboratory evaluation of *Rogas lymantriae*: a braconid endoparasite of the gypsy moth, *Lymantria dispar*.** Entomophaga. 36(2): 205-212.

Rogas lymantriae Watanabe was reared on *Lymantria dispar* (L.) for 125 generations in the laboratory following importation from Japan. No deleterious effects of colonization were observed and one measured parameter, successful parasite emergence, improved significantly over time. Decreased density of the host of conspecific female parasites resulted in higher levels of parasitism and numbers of females in the next generation. During three different years, colony production increased significantly to provide parasites for inoculative releases in the field.

Hackett, Ronald L.; Widmann, Richard H. 1991. **Pulpwood production increase continues during 1989 in the northern states.** Northern Logger. 39(8): 6-7.

Information for this article was summarized from data supplied by all of the operating pulpmills in the Northeastern and North-Central States; the particleboard, waferboard, oriented-strand board, and medium-density fiberboard mills in the Lake States; and all mills in other states and Canada that received pulpwood from the study area in 1989.

Haissig, Bruce F.; Kirk, T. Kent; Olsen, William L.; Raffa, Kenneth F.; Slavicek, James M., eds. 1991. **Abstracts of papers presented at the international symposium on applications of biotechnology to tree culture, protection, and utilization.** Gen. Tech. Rep. NE-152. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 141 p. Includes 34 extended abstracts and 43 poster abstracts on aspects of the application of biotechnology/molecular biology to forestry research in the areas of woody plant growth, protection, and utilization.

Hamilton, Julia A.; Crompton, John L.; More, Thomas A. 1991. **Identifying the dimensions of service quality in a park context.** Journal of Environmental Management. 32: 211-220.

Previous investigations of service quality in several private-sector services have suggested that it consists of five dimensions: tangibles, reliability, responsiveness, assurance and empathy. This study was concerned with whether or not these dimensions describe service quality in the context of parks and, if so, which dimensions were most important. The results indicated that service quality in parks is described by four dimensions: tangibles, reliability, responsiveness, and assurance. There were differences in perceived service quality between users of different parks. The most important dimension was tangibles.

Hammett, A. L., III; Cabbage, Frederick W.; Luppold, William G. 1991. **Southern Appalachian hardwood lumber manufacturers: characteristics of exporters and nonexporters.** Forest Products Journal. 41(7/8): 70-76. Hardwood lumber manufacturers located in seven southern Appalachian states were surveyed to obtain an overview of business practices common to exporters and nonexporters. Those mills selling to international markets had greater production levels, larger lumber inventories, and sawed more of their product from higher lumber grades. Hardwood lumber producers that had not sold to international markets had smaller sales staffs, used less advertising, had fewer employees, and cut smaller percentages of red and white oak, which are species traditionally used for lumber exports.

Hansen, Bruce G. 1991. **An overview of Asian and European markets for U.S. hardwood lumber.** In: Competing in today's world markets: FPRS 45th annual meeting; 1991 June 23-26; New Orleans, LA. Madison, WI: Forest Products Research Society: 21. Abstract.

Hansen, Bruce G. 1991. **Taiwanese wood product manufacturers' use of United States hardwood lumber.** In: Competing in today's world markets: FPRS 45th annual meeting; 1991 June 23-26; New Orleans, LA. Madison, WI: Forest Products Research Society: 44. Abstract.

Hansen, Bruce G.; Luppold, William G. 1991. **New estimates of hardwood lumber exports to Europe and Asia: market trends, species, and sources.** In: Competing in today's world markets: FPRS 45th annual meeting; 1991 June 23-26; New Orleans, LA. Madison, WI: Forest Products Research Society: 44. Abstract.

- Hansen, Bruce G.; Luppold, William G.; Thomas, R. Edward. 1991. **Revised data on U.S. hardwood lumber export volumes to Europe, 1981 to 1990.** Northern Journal of Applied Forestry. 8(4): 156-160.
- During the past decade, poor documentation and computer software containing outdated price parameters used to screen and "correct" data taken from U.S. export declarations resulted in significant overestimation of official U.S. hardwood lumber export volumes. In the year prior to their correction, U.S. hardwood lumber exports to Europe were about half of the officially reported volume. Although official statistics indicated red oak was the most important species traded, the new data indicate that white oak exports in 1988 were 3 times greater than red oak exports. To provide a check on the official statistics and to revise previous export volume data, new estimates were developed using information taken directly from ship manifests. These data provided a more accurate assessment of U.S./European trade as well as new insights into the species composition and geographic source of U.S. exports.
- Hansen, Bruce G.; Sinclair, Steven A. 1991. **Wood use in office furniture manufacture.** Forest Products Journal. 41(5): 33-35.
- Discusses changes in the office-furniture industry's use of wood-based materials between 1967 and 1987. The importance of this industry relative to the wood household-furniture industry as a consumer of wood-based materials has increased significantly since 1967. While the total use of all wood-based material inputs by the industry is at record levels, the use of specific materials per unit of output has been mixed.
- Harris, M. M.; Riha, S. J. 1991. **Carbon and nitrogen dynamics in forest floor during short-term laboratory incubations.** Soil Biology and Biochemistry. 23(11): 1035-1041.
- The supply of nitrogen (N) to forest trees depends on seasonal patterns of N turnover. This study was conducted to examine factors that control the decomposition of organic matter and the relationship between such decomposition and the release of mineral N. Samples of forest floor (organic soil horizons) from plantations of red pine, Norway spruce, sugar maple, and black locust were collected periodically from May 1987 to December 1988.
- Harshman, L. G.; Casas, J.; Dietze, E. G.; Hammock, B. D. 1991. **Epoxide hydrolase activities in *Drosophila melanogaster*.** Insect Biochemistry. 21(8): 887-894.
- Harshman, Lawrence G.; Vickers, Joanna M.; Ichinose, Reiji; Grant, David F.; Ward, Vernon K.; Eldridge, Bruce F. 1991. **Effects of recombinant juvenile hormone esterase on *Aedes aegypti*.** 1991 Proceedings, California Mosquito Vector Control Association: 59: 77- 80.
- Healy, William M. 1991. **Trends in management of oak forests for wild turkeys.** In: Laursen, Steven B.; DeBoe, Joyce F., eds. The oak resource in the upper Midwest implications for management: conference proceedings; 1991 June 3-6; Winona, MN. Publ. NR-BU-5663-S. St. Paul, MN: University of Minnesota: 45-55.
- Oaks play a "keystone" role in eastern wildlife communities. Many species of wildlife depend on acorns for food, and some species are responsible for the long-distance dispersal of acorns. There is strong evidence that eastern oak forests are about to undergo a dramatic change. Oaks seem unable to replace themselves on average and good growing sites. The ultimate cause for the decline of oak appears to be a change in fire frequency. More intensive silviculture, and perhaps some new techniques, will be needed to maintain oak ecosystems.
- Heisler, Gordon M.; Dix, Mary Ellen. 1991. **Effects of windbreaks on local distribution of airborne insects.** In: Dix, Mary Ellen; Harrell, Mark O., eds. Insects of windbreaks and related plantings: distribution, importance, and management; conference proceedings; 1988 December 6; Louisville, KY. Gen. Tech. Rep. RM-204. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 5-12.
- Both vegetative and artificial windbreaks modify wind flow streamlines, reduce horizontal windspeeds, and alter the turbulence structure of wind. These changes increase the aerial density of insects of many taxa.
- Helvey, J. David; Kochenderfer, James N. 1991. **Time trends in selected chemical characteristics of streamflow from an undisturbed watershed in West Virginia.** In: Rennie, P. J.; Robitaille, G., eds. Effects of acid rain on forest resources; 1983 June 14-17; Sainte-Foy, PQ. Inf. Rep. DPC-X-35. Ottawa, ON: Forestry Canada: 429-437.
- Stream chemistry records for a 38.9-ha watershed, undisturbed since 1910, were analyzed for time trends in pH between 1968 and 1982, specific conductance between 1958 and 1982, and concentrations of calcium, magnesium, potassium, and sodium between 1970 and 1982. The pH analysis was inconclusive because of an instrument change in 1975, but changes if they occurred were small. There was no change in levels of sodium, potassium, or magnesium, but specific conductance and calcium concentration have increased slightly in recent years. Precipitation acidity might be influencing the chemical content of streamflow from this watershed.
- Hicks, Ray R., Jr.; Fultineer, Robert M.; Ware, Barbara S.; Gottschalk, Kurt W. 1991. **Susceptibility and vulnerability of young oak regeneration in clearcuts to defoliation by gypsy moth.** In: Proceedings of the national gypsy moth review; 1991 November 4-7; Raleigh, NC. Raleigh, NC: National Gypsy Moth Management Board: 80-92.
- Hicks, Ray R., Jr.; Fultineer, Robert M.; Ware, Barbara S.; Gottschalk, Kurt W. 1991. **Gypsy moth defoliation in clearcuts.** In: 1991 annual report. Morgantown, WV: West Virginia University: 38-40.
- Hiremath, Shivanand T.; Fikes, Martha; Ichida, Audrey. 1991. **Construction of a transfer vector for a clonal isolate of LDNPV.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review

1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 53. Abstract.

Hix, David M.; Fosbroke, David E.; Hicks, Ray R., Jr.; Gottschalk, Kurt W. 1991. **Development of regeneration following gypsy moth defoliation of Appalachian Plateau and Ridge & Valley hardwood stands.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 347-359.

The effects of gypsy moth defoliation and subsequent overstory mortality on regeneration were examined in 26 stands in Pennsylvania and Maryland. The Pennsylvania stands were located in the Appalachian Plateau physiographic province, and the Maryland stands were located in the Ridge & Valley province. Predefoliation data (1984-86) were compared with post-defoliation data (1989) from the same 315 six-foot-radius plots. Seedlings of all woody vegetation were counted by species and height class. Separate matched pair t-tests were used to test for differences in pre- and post-defoliation regeneration counts for the most common species in each province. In the Appalachian Plateau, total numbers of white oak, chestnut oak, and northern red oak decreased while the numbers of less desirable species (red maple, blueberries, raspberries, and greenbriers) increased following defoliation. In the Ridge & Valley, the number of white oak also decreased; however, there was an increase in the number of chestnut oak and northern red oak, and in the number of less desirable species: red maple, black cherry, serviceberry, blueberries, and raspberries.

Hoff, Kristen G.; Adams, Edward L.; Walker, Elizabeth S. 1991. **GR-1ST: PC program for evaluating gang-rip-first board cut-up procedures.** Gen. Tech. Rep. NE-150. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 16 p. As the price of the better grades (Firsts & Seconds and Selects) of lumber continues to climb, many furniture and cabinet manufacturers have begun to process parts from No. 1 and No. 2 Common lumber. However, getting the optimum parts yield from these lower grades of lumber is difficult when using the traditional crosscut-first procedure. A gang-rip-first procedure is one solution to this problem, and a microcomputer program called GR-1ST (gang-rip-first) is now available.

Hollenhorst, Steven J.; Brock, Samuel M.; Freimund, Wayne A.; Twery, Mark J. 1991. **Effects of gypsy moth infestation on near-view aesthetic preferences and recreation behavior intentions.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 23-33.

Holmes, Michael J.; Reed, David D. 1991. **Competition indices for mixed species northern hardwoods.** Forest Science. 37(5): 1338-1349.

Several competition indices are evaluated to determine their relationship with annual diameter growth in mixed-species northern hardwood stands in upper Michigan. Indices are evaluated on four species with different shade tolerance. A new index that incorporates factors representing both root and crown competition is formulated and tested. Simple size-ratio indices perform as well or better in their correlation with annual diameter growth than growing space, area overlap, and root/crown indices. Hegyi's index and several forms of the new root/crown index show the most consistent performance across study species.

Hornbeck, James W. 1991. **Nutrient depletion: a problem for forests in New England and Eastern Canada?** In: Mahendrapa, M. K.; Simpson, C. M.; van Raalte, G. D. comps. Proceedings of the conference on the impacts of intensive harvesting; 1990 January 22; Fredericton, NB. Fredericton, NB: Forestry Canada: 56-67. [In English and French].

Describes the kinds of information needed to incorporate nutrient cycling into management activities and decisions and provides recommendations for protecting forest nutrient cycles.

Hornbeck, James W.; Federer, C. Anthony. 1991. **Acid rain and the buffer capacity of forest soils.** In: Rennie, P. J.; Robitaille, G., eds. Effects of acid rain on forest resources; 1983 June 14-17; Sainte-Foy, PQ. Inf. Rep. DPC-X-35. Ottawa, ON: Forestry Canada: 177-186.

Past reviews of the effects of acid rain on soil nutrients suggest five major concerns: increased leaching losses; reduction in cation exchange capacity; accelerated weathering of soil minerals; mobilization of toxic elements; and changes in soil biota. These effects assume that acid precipitation accelerates soil acidification. We studied the capacity of forest soils to buffer H^+ in precipitation by adding H^+ and OH^- to soil samples from forested sites in Maine, New Hampshire, and Connecticut. The change in pH for a unit addition of H^+ or OH^- is nearly independent of pH for these soils. Buffer capacity ranged from 5 to 15 $mmol (H^+) kg^{-1} pH^{-1}$ in our mineral soils, and from 20 to 100 $mmol (H^+) kg^{-1} pH^{-1}$ in our forest floors. The buffer capacity was closely related to organic content. In a worst case situation in which mitigating factors are neglected, our buffer-capacity values indicate that a change in pH of one unit in the forest floors would require an addition of only 2 to 10 $kmol (H^+) ha^{-1}$, while a change of one unit in the mineral soil would require 30 to 50 $kmol (H^+) ha^{-1}$. These data suggest that forest soils may not be the super buffer that is sometimes depicted.

Horsley, Stephen B. 1991. **Allelopathy.** In: Avery, Martha E.; Cannell, Marvin G. R.; Ong, Chin K., eds. Biophysical research for Asian agroforestry. New Delhi, India: Winrock International, USA and South Asia Books, USA: 167-183. Discusses methods for evaluating whether allelopathy is an important component of interference in agroforestry systems.

- Horsley, Stephen B. 1991. **Using Roundup and Oust to control interfering understories in Allegheny hardwood stands.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 281-290.
- Houston, D. R. 1991. **Changes in nonaggressive and aggressive subgroups of *Ophiostoma ulmi* within two populations of American elm in New England.** Plant Disease. 75(7): 720-722.
- Surveys of elms with Dutch elm disease in Vermont (1989) and in Millinocket, Maine (1986 and 1989), revealed the continued decline of the nonaggressive (NA) subgroup of *Ophiostoma ulmi*. This subgroup has virtually disappeared from Vermont; only two of 200 isolates were NA. The same trend was apparent for the isolated elm population in Millinocket, where less than 10 percent of the 1989 isolates were NA. The pattern of spread of the aggressive subgroup within Vermont appears to support the concept that this subgroup entered the state from the west and south along elm-rich valley corridors. Since 1980, the structure of the diseased elm population has shifted from scattered, large trees to abundant, small trees and saplings.
- Houston, David R. 1991. **Changes in tree pathogen populations—a consideration for the arborist?** Tree Times Quarterly. 2(3): 1-2.
- Hunt, E. Raymond, Jr.; Running, Steven W.; Federer, C. Anthony. 1991. **Extrapolating plant water flow resistances and capacitances to regional scales.** Agricultural and Forest Meteorology. 54: 169-195.
- The principal objective for models of water flow through the soil-plant-atmosphere system is the accurate prediction of leaf-water potential and water uptake by roots for a given soil water potential and transpiration rate. Steady-state models of water flow through plants, which include only resistances, are sufficient to predict total daily water uptake by roots. Nonsteady-state models, which use both water flow resistances and capacitances, are necessary for the prediction of "leaf" and instantaneous rate of water uptake for diurnal variations of transpiration rate. Potential difference resistances and capacitances are defined for water flow (volume/time) and are best used for individual plant models; resistivities and capacitivities are based on volume flux density ((volume/land surface area)/time) and should be used for plant stands.
- Huyler, Neil; LeDoux, Chris B. 1991. **A comparison of small tractors for thinning central hardwoods.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 92-104.
- Young-growth hardwood forests in the central hardwood region will require intensive management if they are to help meet the nation's increasing demand for wood. Such management generally will require entries into the stands when the trees are small. Many small-scale machines are available for harvesting small wood. Time and motion studies were conducted on a small-scale logging operation in the Northeast. The small tractors were studied in a wide range of forest and operating conditions. The machines include the Pasquali 933, a Holder A60F, a Forest Ant Forwarder (Skogsmyran), a Same minitaurus, and a Massey-Ferguson. Results showed that the Forest Ant should be used only as a forwarding machine while the skidding tractors—Holder, Pasquali, Same, and Massey-Ferguson—should be used in stands of medium to large stems and with short skid distances.
- Jennings, Daniel T.; Crawford, Hewlette S., Jr.; Hunter, Malcolm L., Jr. 1991. **Predation by amphibians and small mammals on the spruce budworm (Lepidoptera: Tortricidae).** Great Lakes Entomologist. 24(2): 69-74.
- Jensen, Keith F. 1991. **Photosynthesis of woody plants: the impact of acidic pollutants, oxidants, and heavy metals.** In: Rennie, P.J.; Robitaille, G., eds. Effects of acid rain on forest resources; 1983 June 14-17; Sainte-Foy, PQ. Inf. Rep. DPC-X-35. Ottawa, ON: Forestry Canada: 121-130.
- Air pollutants reduce the photosynthetic rate of both deciduous and conifer trees. The reduction varies with the pollutant, the dose, and the plant species. Sulfur dioxide and ozone can cause a significant reduction in photosynthesis before visible injury can be observed. The reductions usually are measurable only during fumigation treatments or immediately afterward because the photosynthetic rate generally returns to the pre-fumigation level within 24 hours if no injury is present. The mechanism or mode of action by which pollutants reduce photosynthesis is not completely understood but appears to involve one or more of the following: 1) modification of stomata activity; 2) degradation of chlorophyll; 3) disruption of cell membranes and chloroplast; 4) inhibition of enzyme activity.
- Jensen, Keith F.; Loats, Ken V. 1991. **Response of three hardwood species to elevated CO₂ and ozone.** In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 16. Abstract.
- Judd, Michael; Meyer, Christopher; Sinclair, Steven A.; Luppold, William G. 1991. **Wood and wood-based material use in the wood furniture industry.** In: Competing for today's world markets: FPRS 45th annual meeting; 1991 June 23-26; New Orleans, LA. Madison, WI: Forest Products Research Society: 41. Abstract.
- Keating, S. T.; Elkinton, J. S.; Burand, J. P.; Podgwaite, J. D.; Ferguson, C. S. 1991. **Field evaluation of a DNA hybridization assay for nuclear polyhedrosis virus in gypsy moth (Lepidoptera: Lymantridae) larvae.** Journal of Economic Entomology. 84(4): 1329-1333.

Kittredge, David B., Jr.; Healy, William M. 1991.

Uneven-aged forest management: Implications for wildlife and habitat management. In: Vodak, Mark C., ed. Uneven-aged management of hardwoods in the Northeast: proceedings of the conference; 1991 April 9-10; Lambertville, NJ. New Brunswick, NJ: Cook College-Rutgers University: 82-86.

Uneven-age management is an appropriate silvicultural tool in eastern hardwood forests for protecting and enhancing wildlife habitat. Because of the stand structure and species composition that results from this form of management, the following components of habitat are influenced: browse, cover, herbage, mast, and den-tree frequency. At the forest and landscape levels, uneven-age management can provide a diversity of stand conditions (structure, tree size, age, and species composition) that will foster overall biodiversity of species, habitats, and ecosystems.

Kochenderfer, J. N.; Wendel, G. W.; Smith, H. Clay;

Yamamoto, Masashi. 1991. **Cost of and soil loss on "minimum-standard" forest truck roads constructed in the central Appalachians.** Journal of Japan Forest Engineering Association. 6(1): 29-33. [In Japanese; translation of Research Paper NE-544.]

Krause, C.R.; Cannon, W.N., Jr. 1991. **Epistomatal wax injury to red spruce needles (*Picea rubens* Sarg.) grown in elevated levels of ozone and acidified rain.** Scanning Microscopy. 5(4): 1173-1180.

Red spruce seedlings were exposed to charcoal-filtered air, at 0.07 ppm or 0.15 ppm ozone (O₃), alone or in combination with pH 4.2 or pH 3.0 acidified rain, and examined with scanning electron microscopy to determine if epistomatal wax fine structure was affected. Acidified rain in combination with 0.15 ppm O₃ produced changes in wax tubule morphology. Changes were moderate at pH 4.2 and severe at pH 3.0. Needles collected from Whiteface Mountain, New York, displayed injured epistomatal wax structure similar to that observed on needles exposed in the laboratory to 0.15 ppm O₃ plus pH 3.0 acidified rain.

Lamson, Neil I.; Smith, H. Clay. 1991. **Yields of**

Appalachian hardwood stands managed with single-tree selection for at least 30 years. Res. Pap. NE-655. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 6 p.

Appalachian hardwood stands in West Virginia were managed for 30 or more years by single-tree selection regeneration practices. Data on stand yield suggest that current stand growth will provide economical harvest cuts for several future cutting cycles. This case study indicates that single-tree selection has potential for landowners who want to maintain continuous overstory cover and are willing to accept the gradual shift to the more shade-tolerant species.

Lawrence, Gregory B.; Fernandez, Ivan J. 1991.

Biogeochemical interactions between acidic deposition and a low-elevation spruce-fir stand in Howland, Maine. Canadian Journal of Forest Research. 21: 867-875.

Leak, William B. 1991. **Secondary forest succession in New Hampshire, USA.** Forest Ecology and Management. 43(1&2): 69-86.

Secondary forest succession in the northern hardwood and spruce-hemlock forests of central New Hampshire was examined by regressing percentage composition of the major species over stand age, using both temporary and remeasured plots in essentially uncut stands ranging in age from 3 to more than 190 years. Plots were classified by site: fine till, sandy till, and softwood sites. Successional change varied by site, and five ecological species roles were detected: dominating climax, stable climax, minor climax, persistent successional, and temporary successional species. After heavy cutting, stands on fine till sites move through an abundance of successional species such as pin cherry, aspen, paper birch, and yellow birch toward a predominance of sugar maple and American beech. A similar trend occurs on sandy till, though red maple--a low nutrient-demanding species--is a more common successional species and American beech is much more aggressive than sugar maple. On softwood sites (shallow, dry, wet, or poorly aerated soils), the successional species, including high proportions of red maple, are succeeded by a predominance of eastern hemlock and, especially at higher elevations, red spruce.

Leak, William B. 1991. **Managing northern hardwoods using uneven-age principles.** In: Vodak, Mark C., ed. Uneven-aged management of hardwoods in the Northeast: proceedings of the conference; 1991 April 9-10; Lambertville, NJ. New Brunswick, NJ: Cook College-Rutgers University: 34-39.

Individual-tree and group-selection concepts are discussed with application to northern hardwoods in New England. Flexible guidelines on stand density and diameter distribution are advocated to facilitate marking, and to allow for an array of markets, stand conditions, and owner objectives.

LeDoux, Chris B.; Baumgras, John E. 1991. **The interactive impact of forest site and stand attributes and logging technology on stand management.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 148-156.

The impact of selected site and stand attributes on stand management is demonstrated using actual forest model plot data and a complete systems simulation model called MANAGE. The influence of terrain on the type of logging technology required to log a stand and the resulting impact on stand management is illustrated. The results can be used by managers and planners in making decisions on how best to manage the hardwood resource.

LeDoux, Chris B.; Baumgras, John E. 1991.

Interdisciplinary research can provide information for the harvesting challenges of the 1990's. In: McNeel, J. F.; Andersson, Bjorn, eds. Forestry operations in the 1990's; challenges and solutions: proceedings of the 14th annual meeting of the Council on Forest Engineering; 1991 July 22-25; Nanaimo, BC.

[Place of publication unknown]: [Publisher name unknown]: 126-130.

Management of our complex forest ecosystems in the economic and political climate of the 1990's is a challenge for planners, managers, and loggers. A multifunctional approach can improve the effectiveness of forest operations research. Since harvesting cost and revenue are closely related to changing stand attributes, harvest models must be linked with dynamic growth and yield models to accurately assess the impact of site and stand attributes on logging cost and stand management. The application of a model called MANAGE is described.

LeDoux, Chris B.; Baumgras, John E.; Sherar, James; Campbell, Tom. 1991. **Production rates and costs of group selection harvests with a Christy cable yarder.** In: Stokes, Bryce J.; Rawlins, Cynthia L., eds. *Forestry and environment...engineering solutions*; 1991 June 5-6; New Orleans, LA. ASAE Publ. 09-91. St. Joseph, MI: American Society of Agricultural Engineers: 75-84.

Summarizes results of comprehensive detailed time studies in calculating incremental stump-to-landing production rates and costs per volume for cable yarding hardwoods by group selection.

Lewis, Robert; DeLaney, William F. 1991. **Promoting innovation and creativity.** *Research-Technology Management*. 34(3): 21-25.

A pilot test program to explore new ways to enhance the value of a creative and innovative work environment in the USDA Forest Service is described.

Liebhold, A. M.; Elkinton, J. S. 1991. **Gypsy moth dynamics.** *Trends in Ecology and Evolution*. 6(8): 263-264.

Liebhold, Andrew; Elkinton, Joseph S. 1991. **Analysis of spatial density dependence in gypsy moth mortality.** In: *Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990*; 1990 January 22-25, East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 50. Abstract.

Liebhold, Andrew; Halverson, Joel; Elmes, Gregory; Hutchinson, Jay. 1991. **Landscape ecology of gypsy moth in the Northeastern United States.** In: *Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990*; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 113. Abstract.

Liebhold, Andrew M.; McManus, Michael L. 1991. **Does larval dispersal cause the expansion of gypsy moth outbreaks?** *Northern Journal of Applied Forestry*. 8(3): 95-98.

Pest managers often suggest that gypsy moth outbreaks spread from one area to another. An example of this concept is the "focal area" theory which contends that outbreaks begin in small, specific areas (foci) and expand into larger, concentric zones about this area in successive years. The

hypothesized mechanism for this expansion is dispersal of first-instar larvae. A simple simulation model was developed to describe the role of dispersal and biomodal density-dependent mortality in the spatial dynamics of gypsy moth densities. Using this model, it was impossible to explain large-scale expansion of outbreaks from foci. Thus, dispersal is an unlikely cause of the commonly observed expansion of defoliated areas. Instead, it is thought that these patterns are caused by the spatial distribution of resistant tree stands and that, on a regional scale, spatially separate populations operate largely independently of one another.

Liebhold, Andrew M.; Silk, Peter J. 1991. **Capture of *Choristoneura pinus maritima* in traps baited with *C. pinus pinus* pheromone components (Tortricidae).** *Journal of the Lepidopterists' Society*. 45(2): 172-173. Discusses whether *C. pinus maritima* populations are attracted to traps baited with *C. pinus pinus* pheromone components.

Liebhold, Andrew; Twardus, Daniel; Buonaccorsi, John. 1991. **Evaluation of the timed-walk method of estimating gypsy moth (Lepidoptera: Lymantriidae) egg mass densities.** *Journal of Economic Entomology*. 84(6): 1774-1781.

Timed walks are widely used by pest managers to estimate gypsy moth 100g-mass densities. An individual walks through a woodlot (typically for 5 minutes) and counts all egg masses observed. These counts are used in one of several linear regression equations to estimate egg masses per unit area. We evaluated the statistical properties of these estimates. At several 25-ha woodlots, we estimated true egg-mass densities by counting egg masses in multiple fixed-radius plots. Two observers then made four 5-minute walks through each woodlot. These counts were more highly correlated with estimated density when expressed as numbers per walk than as number per distance walked. Analysis of variance indicated that timed counts varied significantly among observers. For individual observers, counts of egg masses per walk were used to develop linear regressions for predicting egg-mass densities. Results indicate that even if separate regression equations were developed for each observer, the timed-walk method provides imprecise estimates.

Liebhold, Andrew M.; Zhang, Xu; Hohn, Michael E.; Elkinton, Joseph S.; Ticehurst, Mark; Benzon, Gary L.; Campbell, Robert W. 1991. **Geostatistical analysis of gypsy moth (Lepidoptera: Lymantriidae) egg mass populations.** *Environmental Entomology*. 20(5): 1407-1417.

Logan, J. A.; Casagrande, R. A.; Liebhold, A. M. 1991. **Modeling environment for simulation of gypsy moth (Lepidoptera: Lymantriidae) larval phenology.** *Environmental Entomology*. 20(6): 1516-1525.

The ability to predict larval phenology for the gypsy moth is of interest for a variety of reasons. Problems with the development of an appropriate model to predict larval phenology for the pest are exacerbated by the large, often complex landscapes that must be considered in control programs, and by the gypsy moth's extensive geographic

distribution. The goal of research is to provide a flexible modeling system that can be used to construct a phenology model that is well suited for a particular application. Our primary objective is to provide a convenient modeling framework for field testing and applying gypsy moth larval phenology models.

Luppold, Bill; Thomas, Ed. 1991. **New estimates of hardwood lumber exports reveal much about southern patterns.** Southern Lumberman. 3: 16-17. Recent work by the Northeastern Forest Experiment Station indicates that the South is really two distinct regions--the Southeast and the South-Central--as these regions have different export patterns.

Luppold, William G. 1991. **Hardwood lumber demand in the 1990's.** In: Proceedings of the 19th annual hardwood symposium of the Hardwood Research Council: facing uncertain futures and changing rules in the 1990s; 1991 March 10-12; Starkville, MS. Starkville, MS: Mississippi State University: 57-63.

Hardwood lumber demand is greatly affected by occurrences and forces outside of the hardwood industry. In the 1980's these forces resulted in the increased use of hardwood lumber in the production of commercial furniture, pallets, and construction-related products. Hardwood exports also continued to grow throughout much of the 1980's. Hardwood lumber demand in the 1990's will be affected by changes in society, technology, institutions, and international timber supplies. Although the demand for hardwood lumber should continue to grow in the 1990's, potential changes in the pallet and furniture industries should be watched closely by the hardwood industry.

Luppold, William G. 1991. **Can good policy be developed from bad data?** In: Chang, Sun Joseph, comp. Proceedings, southern forest economics workshop on environmental concerns, government regulations, new technology and their impact on southern forestry; 1991 February 20-22; Washington, DC. Baton Rouge, LA: Louisiana State University Agricultural Center: 129-136.

Luppold, William; Thomas, Edward. 1991. **New estimates of hardwood lumber exports from the central hardwood region.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 535-542.

Exports have become an increasingly important part of the overall hardwood lumber market. However, recent findings indicate that much of the reported growth of hardwood lumber exports in the 1980's was based on inflated volume data. New estimates of hardwood lumber exports to Asia and Europe are presented with emphasis on the central hardwood region of the United States. Although the central region has become a major source of hardwood lumber, exporters in the eastern and western regions have a much larger share of the European and Asian markets.

Luppold, William G.; Thomas, R. Edward. 1991. **New estimates of hardwood lumber exports to Europe and Asia.** Res. Pap. NE-652. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 22 p.

Explains how earlier estimates of hardwood-lumber exports were in error, discusses the procedures used to develop a new set of hardwood-lumber export estimates, and presents a detailed set of new hardwood-lumber export estimates for European and Asian markets.

Luppold, William G.; Thomas, R. Edward. 1991. **Revised estimates of hardwood log exports to major EC and Pacific Rim markets.** Forest Products Journal. 42(7/8): 35-40.

Contrasts commonly published export statistics developed from Bureau of the Census data against a new set of log export statistics developed from shipping manifests. Historic census estimates of hardwood log exports to the Pacific Rim appear to be accurate, but current estimates (since 1989) appear to be inflated. The prime causes of historic errors in export data were incorrect export documentation by shippers and problems with the computer program used to compile export statistics.

Luppold, William G.; Thomas, R. Edward. 1991. **A revised examination of hardwood lumber exports to the Pacific Rim.** Forest Products Journal. 41(4): 45-48.

Asian exports were one of the most frequently discussed components of the hardwood lumber market in the 1980's. Much of this attention was the result of the apparent growth in Asian exports from 22 to 414 million board feet between 1980 and 1988. However, findings indicate that 1988 exports were only 208 million board feet or nearly one-half of the officially reported volume. The inflated value of prior export estimates was the result of problems in U.S. Department of Commerce computer programs that screened and compiled export statistics, combined with incorrect filing of export declarations.

Luppold, William G.; Thomas, R. Edward. 1991. **New estimates of hardwood-log exports to Europe and Asia.** Res. Pap. NE-659. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 24 p.

Luppold, William; Thomas, Edward. 1991. **Estimates of hardwood lumber exports: the central hardwood region.** Ohio Woodland Magazine. (Summer): 20-21. Although the central hardwood region manufactures more than 50 percent of the hardwood lumber produced in the United States, the amount of lumber directly exported from this region is substantially less. Part of this apparent discrepancy can be attributed to shipments of exportable lumber from the central to coastal regions. However, the cost of transporting products to international markets is increased because many of the states in the central region are landlocked. Still, the north-central region has increased its share of exports to Europe relative to all other eastern regions.

- Lynch, James A.; Corbett, Edward S. 1991. **Long-term implications of forest harvesting on nutrient cycling in central hardwood forests.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 500-518.
- Fourteen years of data on streamflow and water quality from the Leading Ridge Experimental Watersheds in central Pennsylvania were analyzed to determine the long-term impact of a commercial forest harvest on stream water chemistry and nutrient loss. Clearcutting 44.5 ha of an 104-ha watershed resulted in significant increases in nitrate and potassium concentrations and significant decreases in calcium, magnesium, potassium, and sodium concentrations the first year following harvesting. Although statistically significant, the observed changes in ionic concentrations did not cause a serious deterioration in stream quality. Changes in most solute concentrations seemed to return to precutting levels by the third year.
- Lynch, J. A.; Corbett, E. S.; Grimm, J. W. 1991. **Enhancement of regional wet deposition estimates based on modeled precipitation inputs.** In: NADP technical committee meeting: abstracts of papers; 1991 October 7-10; Philadelphia, PA. Fort Collins, CO: National Atmospheric Deposition Program: 7. Abstract.
- Lynch, J. A.; Corbett, E. S.; Grimm, J. W.; Bowersox, V. C. 1991. **SO_x, NO_x, and acid rain: Is there a relationship?** In: NADP technical committee meeting: abstracts of papers; 1991 October 7-10; Philadelphia, PA. Fort Collins, CO: National Atmospheric Deposition Program: 8. Abstract.
- Madamanchi, Nageswara R.; Hausladen, A.; Alscher, Ruth G.; Amundson, R. G.; Fellows, S. 1991. **Seasonal changes in antioxidants in red spruce (*Picea rubens* Sarg.) from three field sites in the northeastern United States.** New Phytopathology. 118: 331-338.
- Maddox, J. V.; Jeffords, M. R.; McManus, M. L.; Webb, R. E. 1991. **Summary of experimental releases of exotic microsporidia: conclusions and recommendations.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 81. Abstract.
- Mahoney, Eileen M. 1991. **Molecular genetic relationships of *Nectria coccinea* var. *Fagnata*, a pathogen of American beech, to European and North American nectrias.** Phytopathology. 81(10): 1142.
- Marquis, David A. 1991. **Independent effects and interactions of stand diameter, tree diameter, crown class, and age on tree growth in mixed-species, even-aged hardwood stands.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 442-458.
- Many studies have shown that initial tree diameter is closely correlated with subsequent tree growth. But initial tree diameter is a confounded variable, incorporating both competitive position (crown class) and age. A study in hardwood stands in Pennsylvania has shown that the two latter variables were more reliable predictors of tree growth than initial diameter. These two variables lack the confounding of initial diameter, and are biologically more appropriate parameters for inclusion in growth simulators. Surrogate variables calculated from typical cruise data were nearly as well correlated with growth as the more difficult-to-measure crown class and age.
- Marquis, David A. 1991. **Management of hardwood forests in the Mid-Atlantic region: past, present, and future.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 1.
- Marquis, David A. 1991. **Uneven-age management in the cherry-maple forest type.** In: Vodak, Mark C., ed. Uneven-aged management of hardwoods in the Northeast: proceedings of the conference; 1991 April 9-10; Lambertville, NJ. New Brunswick, NJ: Cook College-Rutgers University: 5-33.
- Rather than a few cutting methods grouped into two discrete silvicultural systems, there is a nearly limitless continuum of silvicultural practices available. By selecting from an array of systems, modifying the cutting practices and regulatory procedures within each system, and supplementing the traditional timber management practices with measures designed specifically for other resources, it is possible to meet the diverse needs of a wide range of forest management objectives. Creative extension of traditional methods and careful analysis of the impacts of this wide range of options are critical.
- Marquis, David A. 1991. **A multi-resource silvicultural decision model for forests of the Northeastern United States.** In: Buford, Marilyn A., comp. Proceedings of the 1991 symposium on systems analysis in forest resources; 1991 March 3-6; Charleston, SC. Gen. Tech. Rep. SE-74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 173-179.
- A computerized decision model is being developed for forests of the Northeastern United States that will provide expert support for land managers who are developing silvicultural prescriptions to achieve a variety of timber, water, wildlife, aesthetic, and environmental goals. Data on forest vegetation, site conditions, and management objectives are the basis for management recommendations generated by the program. These recommendations are based on knowledge and guidelines accumulated from many years of research on all major forest types throughout the region. Users also can compare the recommended

treatment and other alternatives through stand-growth simulators incorporated into the program.

Marquis, David A.; Ernst, Richard L. 1991. **The effects of stand structure after thinning on the growth of an Allegheny hardwood stand.** *Forest Science*. 37(4): 1182-1200.

A 50-year-old Allegheny hardwood stand in which the crown canopy had stratified into distinct species groups was thinned to 60 percent relative density, leaving dramatically different stand structures and species composition. Treatments included combined thinning, thin from middle, thin from above, thin from below, and unthinned control. Individual-tree growth was stimulated most by thinnings that created openings in the main crown canopy and still retained adequate numbers of the larger stems of the faster growing species. Thinning from below, which removed primarily noncommercial saplings and small poles of the shade-tolerant species, did not affect diameter growth of the larger stems. Total stand growth in basal area and volume was dramatically reduced by thinning from above, which removed nearly all of the larger stems and faster growing species. Treatments that reduced growing stock in the largest size classes, where most of the stand value is concentrated, had a detrimental effect on future timber values. Best individual-tree growth, and best stand growth in basal area, cubic volume, board volume, and dollar value occurred in the combined thinning.

Martin, C. Wayne; Tritton, Louise M. 1991. **Role of sprouts in regeneration of a whole-tree clearcut in central hardwoods of Connecticut.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. *Proceedings, 8th central hardwood forest conference*; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 305-320.

Stump sprouts were the single most important type of regeneration in a central hardwood forest in Connecticut during the first 5 years after whole-tree clearcutting. Herbs, shrubs, tree seedlings, and stump sprouts were inventoried using stratified permanent plots on a 6-ha watershed during the first, third, and fifth years after harvest. The first year after cutting 1,540 kg ha⁻¹ of living biomass, including herbs, shrubs, and tree seedlings and sprouts accumulated on the watershed. Of that total, 54 percent was in tree seedlings and sprouts from stumps less than 10 cm, and 13 percent in sprouts from stumps greater than 10 cm. Oaks produced the most sprout biomass from large stumps, followed by maples and chestnut. By the fifth year, 17,990 kg ha⁻¹ of living biomass had accumulated, with 56 percent in tree seedlings and sprouts from small stumps and 15 percent in sprouts from large stumps. The results indicate that sprouts are highly active in the initial accumulation of biomass and nutrients after harvest.

McCormick, Larry H.; Gottschalk, Kurt W., eds. 1991. **Proceedings, 8th central hardwood forest conference**; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 605 p.

Two invited papers, 45 volunteer papers, and 20 poster summaries were presented at the 8th Central Hardwood Forest Conference. Topics included economics, forest amenities, harvesting, utilization, physiology, genetics, ecology, regeneration, silviculture, protection, management, hydrology, soils, nutrient cycling, and hardwood markets of central hardwood forests.

McFadden, Max. 1991. **The USDA interagency research and development coordinating group.** *Gypsy Moth News*. 27: 2-3. Abstract.

McFadden, Max W. 1991. **The North American Sugar Maple Decline Project: planning, organization and implementation.** In: Burns, Denver P., tech. coord. *Research management for the future*; 1990 August 5-11; Montreal, PQ. Gen. Tech. Rep. NE-157. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 3-9.

McFadden, Max W.; McManus, Michael L. 1991. **An insect out of control? The potential for spread and establishment of the gypsy moth in new forest areas in the United States.** In: Baranchikov, Yuri N.; Mattson, William J.; Hain, Fred P.; Payne, Thomas L., eds. *Forest insect guilds: patterns of interaction with host trees*; 1989 August 13-17; Abakan, Siberia, U.S.S.R. Gen. Tech. Rep. NE-153. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 172-185.

In 1869, the gypsy moth was introduced from Europe into North America near Boston, Massachusetts, and now is well established as a serious defoliator of forest, shade, and fruit trees over much of the Eastern United States. Despite substantial efforts to eradicate, contain, or control this pest, the gypsy moth has persisted and continues to extend its range. The generally infested area currently extends from the northeast corner of North Carolina along a diagonal line that extends through Virginia, West Virginia, and the northeast corner of Ohio into Michigan. A vast area of suitable habitat for the gypsy moth, much of which is valuable commercial hardwood forest, lies to the south and west of the generally infested area.

McGraw, James B.; Gottschalk, Kurt W. 1991. **Interactive effects of defoliation and low resource levels on photosynthesis, growth, and gypsy moth larval response to red oak seedlings.** In: *Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990*; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 143. Abstract.

McManus, Michael L. 1991. **Microbial pesticides.** In: *Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990*; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 64-75. Interest in the use of microbial pesticides has intensified because of public concern about the safety of chemical

pesticides and their impact in the environment. Characteristics of the five groups of entomopathogens that have potential as microbial pesticides are discussed, and an update is provided on research and development activities underway to enhance the performance and use of microbial products. Emphasis is placed on viral and bacterial pesticides and their use in managing gypsy moth populations.

McManus, Michael L. 1991. **Gypsy moth, the superbug-- can we contain its spread...and should we?** In: Fell, Richard D., ed. *Entomology in Virginia: new problems and new approaches*. Inf. Ser. 91-2. Blacksburg, VA: Virginia Polytechnic Institute and State University; Virginia Agricultural Experiment Station: 27-35.

McPherson, E. Gregory. 1991. **The bottom line on trees.** *Journal of Arboriculture*. 17(12): 334. Abstract.

McPherson, E. Gregory. 1991. **Cooling urban heat islands with sustainable landscapes.** Work. Pap. 91-10. Tucson, AZ: University of Arizona, Drachman Institute for Land and Regional Development Studies. 16 p.

McPherson, E. Gregory. 1991. **Economic modeling for large-scale urban tree plantings.** In: Vine, E.; Crawley, D.; Centolella, P., eds. *Energy efficiency and the environment: forging the link*. Washington, DC: American Council for an Energy-Efficient Economy: 349-369.

McPherson, E. Gregory; Biedenbender, Sharon. 1991. **The cost of shade: cost-effectiveness of trees versus bus shelters.** *Journal of Arboriculture*. 17(9): 233-241.

McPherson, E. Gregory; Minor, Charlotte T.; Guertin, D. Phillip. 1991. **A prototype model of residential irrigation water use.** In: 10th conference on biometeorology and aerobiology: special session on hydrometeorology; 1991 September 10-13; Salt Lake City, UT. Boston, MA: American Meteorological Society: 63-68.

McPherson, E. Gregory; Rowntree, Rowan A. 1991. **The environmental benefits of urban forests.** In: *A national research agenda for urban forestry in the 1990's*. Urbana, IL: International Society of Arboriculture: 45-49.

McPherson, Greg. 1991. **Cost effective ecological landscapes.** *Earthword*. 2: 40-41.

McQuattie, C. J. 1991. **Influence of acidity and mycorrhizal status on the localization of lead in pine roots.** In: Farmer, J. G., ed. *International conference: heavy metals in the environment*; 1991 September 16-20; Edinburgh, UK. Edinburgh, UK: CEP Consultants: 107-110.

Lead localization and cellular alterations were compared in mycorrhizal (M) and non-mycorrhizal (NM) white pine and pitch pine roots exposed to Pb in solution at pH 2.5 and 4.5. Roots were sampled after 5, 30, 60, and 120 minutes and prepared for electron microscopy. Although acidity level initially altered the visual appearance of Pb deposits, after 120 minutes there were no detectable differences in Pb

localization between M and NM roots of each species at the same acidity level. Ultrastructural changes in root cells suggest that Pb uptake may occur via the root cap and meristem cells in both M and NM roots.

McQuattie, C. J.; Klomparens, K. L. 1991. **Elemental composition of polyphosphate bodies in aluminum-treated *Pisolithus tinctorius*: comparison of chemical and freeze-substitution methods.** In: Bailey, G. W., ed. *Proceedings of the 49th annual meeting of the Electron Microscopy Society of America*; 1991 August 5-10; San Jose, CA. San Francisco, CA: San Francisco Press: 282-283.

After exposure to 50 ppm of aluminum (Al), a measurable quantity of Al was taken up by the mycorrhizal fungus *Pisolithus tinctorius* and was associated with P in some polyP bodies and in dense hyphal areas. This finding supports a previous study that showed that Ca associated with P in polyP bodies is an artifact of aqueous fixation. However, Al was found in association with at least some polyP bodies and in granular areas in hyphae exposed to 50 ppm Al, regardless of fixation method.

McQuattie, C. J.; Klomparens, K. L.; Wood, J. I. 1991. **Comparison of chemical fixation and freeze substitution methods in the localization of lead in polyphosphate bodies of *Pisolithus tinctorius*.** In: Farmer, J. G., ed. *International conference: heavy metals in the environment*; 1991 September 16-20; Edinburgh, UK. Edinburgh, UK: CEP Consultants: 314-317.

The mycorrhizal fungus *Pisolithus tinctorius* was grown in nutrient broth (pH 4.5 or 3.5) in the presence or absence of lead for 12 days. Hyphae from each treatment were prepared by aqueous chemical fixation (CF) or propane-jet freezing followed by freeze substitution (FS) for transmission electron microscopy and energy dispersive X-ray microanalysis. Lead was found in association with phosphorus in many polyphosphate bodies of hyphae prepared by both CF and FS at both acidity levels. Calcium was prominent in polyphosphate bodies of hyphae prepared by CF but not those prepared by FS. Lead appears to be relatively immobile regardless of specimen preparation, while other cations (such as calcium) may redistribute during aqueous fixation.

Mendoza, G. A.; Meimban, R. J.; Luppold, W. G.; Araman, P. A. 1991. **Combining simulation and optimization models for hardwood lumber production.** In: *Pacific Rim forestry--bridging the world: proceedings of the 1991 Society of American Foresters national convention*; 1991 August 4-7; San Francisco, CA. SAF Publ. 91-05. Bethesda, MD: Society of American Foresters: 356-361.

A combined simulation and optimization model that considers both the determination and the implementation of optimal production schedules is described. Emphasis centers on the performance and utilization of various machine centers, including production delays, buffer decks, queue capacities, operating time, and equipment and resource utilization.

Mendoza, Guillermo; Sprouse, William; Araman, Philip A.; Luppold, William G. 1991. **CEASAW: a user-friendly**

computer environment analysis for the sawmill owner. In: Buford, Marilyn A., comp. Proceedings of the 1991 symposium on systems analysis in forest resources; 1991 March 3-6; Charleston, SC. Gen. Tech. Rep. SE-74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 173-179.

Improved spreadsheet software capabilities have brought optimization to users with little or no background in mathematical programming. Enhanced interface capabilities of spreadsheet models now make it possible to combine optimization models with a spreadsheet system. Sawmill production and inventory systems have many features that make them suitable for spreadsheet optimization. A spreadsheet model that optimizes log allocation and lumber production is described.

Mendoza, Guillermo A.; Sprouse, William; Luppold, William G.; Araman, Philip; Meimban, Roger J. 1991. **An integrated management support and production control system for hardwood forest products.** Computers in Industry. 16(4): 343-351.

Miller, D. R.; Yendol, W. E.; McManus, M. L.; Anderson, D. E.; Mierzejewski K. 1991. **Summary of the Blackmo 88 spray experiment.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 79. Abstract.

Miller, Gary W. 1991. **Economic residual stand structure goals for single-tree selection in central Appalachian hardwoods.** In: Coleman, Sandra S.; Neary, Daniel G.; comps. Proceedings of the 6th biennial southern silvicultural research conference; 1990 October 30-November 1; Memphis, TN. Gen. Tech. Rep. SE-70. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 821-831.

Miller, Gary W. 1991. **Practicing uneven-age management: does it pay? Some economic considerations.** In: Vodak, Mark C., ed. Uneven-aged management of hardwoods in the Northeast: proceedings of the conference; 1991 April 9-10; Lambertville, NJ. New Brunswick, NJ: Cook College-Rutgers University: 47-64.

Uneven-age silviculture can be used to regenerate and manage many eastern hardwood stands. Single-tree cutting methods are feasible in stands where a desirable shade-tolerant commercial species can be regenerated following periodic harvests. Partial harvest practices including single-tree selection and diameter-limit cutting have been used for 30 years or more to manage central Appalachian hardwoods on the Fernow Experimental Forest near Parsons, West Virginia. Harvesting results from these areas are presented to help forest managers evaluate financial aspects of partial cutting practices.

Miller, Gary W.; Smith, H. Clay. 1991. **Comparing partial cutting practices in central Appalachian hardwoods.**

In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 105-119.

Variations of diameter-limit and perhaps single-tree selection harvesting are used to regenerate and manage central Appalachian hardwood sawtimber stands. In practice, these methods differ in cut rules, control of stand structure, and cultural treatment of immature stems. Preliminary information is provided that compares the effect of two different harvest practices on the residual stand--species composition, tree quality, stand structure, and return on residual stand value. Data were obtained from second-growth central Appalachian hardwood stands managed under a given harvesting practice for 30 to 40 years. Results indicate that, for the short term, many single-tree selection goals can be achieved with an easy-to-apply diameter-limit harvest of mature trees.

Miller, Gary W.; Smith, H. Clay. 1991. **Applying group selection in upland hardwoods.** In: Uneven-aged silviculture of upland hardwood stands: workshop notes; 1991 February 25-27; Blacksburg, VA. Blacksburg, VA: Virginia Cooperative Extension Service and Virginia Polytechnic Institute and State University: 20-25.

Currently, group selection is not a widespread practice, primarily because application guidelines are not well documented. Suggestions for applying group selection in Appalachian hardwoods are presented.

Millers, Imants; Allen, Douglas C.; Lachance, Denis. 1991. **Changes in sugar maple crown conditions between 1988 and 1989.** Radnor, PA: U.S. Department of Agriculture, Forest Service. (Brochure).

Ninety percent of the dominant/codominant sugar maple crowns in the North American Sugar Maple Decline Project had 15 percent or less crown dieback when the project was initiated. One year later (1989), crown dieback declined slightly. At the same time, foliage transparency increased slightly, especially in stands exposed to low sulfate wet deposition. These data show that an annual fluctuation in crown dieback and foliage transparency occurs, but more data are needed before a significant trend can be determined.

Millers, Imants; Lachance, Denis; Burkman, William G.; Allen, Douglas C. 1991. **North American sugar maple decline project: organization and field methods.** Gen. Tech. Rep. NE-154. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 26 p.

Describes the organization and field methods used in the North American Sugar Maple Decline Project. New methods were developed and tested to measure crown damage. Quality assurance and quality control of the data are given high priority because of the large number of people involved.

Minocha, R.; Minocha, S.C.; Komamine, A.; Shortle, W.C. 1991. **Regulation of DNA synthesis and cell division by polyamines in *Catharanthus roseus* suspension cultures.** Plant Cell Reports. 10: 126-130.

Various inhibitors of polyamine biosynthesis were used to study the role of polyamines in DNA synthesis and cell division in suspension cultures of *Catharanthus roseus* (L.) G. Don. Arginine decarboxylase (ADC; EC 4.1.1.19) was the major enzyme responsible for putrescine production. DL a-difluoromethylarginine inhibited ADC activity, cellular putrescine content, DNA synthesis, and cell division. The effect was reversible by exogenous putrescine. Ornithine decarboxylase (ODC; EC 4.1.1.17) activity was always less than 10 percent of the ADC activity. Addition of DL a-difluoromethylornithine had no effect on ODC activity, cellular polyamine levels, DNA synthesis, and cell division within the first 24 hours but these activities were inhibited by 48 to 72 hours.

Minocha, Subhash C.; Minocha, Rakesh; Komamine, Atsushi. 1991. **Effects of polyamine biosynthesis inhibitors on S-adenosylmethionine synthetase and S-adenosylmethionine decarboxylase activities in carrot cell.** *Plant Physiology and Biochemistry*. 29(3): 231-237.

Montgomery, Michael E. 1991. **Variation in the suitability of tree species for the gypsy moth.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 1-13.

Lymantria dispar L. is a polyphagous defoliator that feeds on a variety of trees and shrubs. These hosts vary considerably in their nutritional value for the gypsy moth. Classifications patterned after those of Mosher are used to group potential hosts into categories that correspond to suitable, marginal, and inadequate. The role of spatial factors (site effects) and temporal factors (establishment phenology) on the variability of host suitability is examined.

Montgomery, Michael E. 1991. **Predicting defoliation by the gypsy moth using egg mass counts and a helper variable.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 144. Abstract.

More, Thomas A. 1991. **The benefits of urban parks: a review and discussion of current research.** *Visitor Behavior*. 6(2): 8-10.

More, Thomas A.; Glass, Ronald J.; Stevens, Thomas H. 1991. **Restoring threatened and endangered species: economic perspectives.** *Human Dimensions in Wildlife Newsletter*. 9(4): 21-23.

Muick, Pamela C. 1991. **Effects of shade on blue oak and coast live oak regeneration in California annual grasslands.** In: Proceedings of the symposium on oak woodlands and hardwood rangeland management; 1990 October 31-November 2; Davis, CA. Gen. Tech. Rep. PSW-126. Berkeley, CA: U.S. Department of Agriculture,

Forest Service, Pacific Southwest Forest and Range Experiment Station: 21-24.

Muth, Robert M.; Dick, Ronald E.; Glass, Ronald J. 1991. **Subsistence use of wildlife resources in Alaska: policy implications for wildlife management in modernizing economies.** In: Mangun, William R., ed. *Public policy issues in wildlife management*. New York: Greenwood Press: 101-115.

Nevel, Robert L., Jr.; Wharton, Eric H. 1991. **The timber industries of Delaware, 1985—a periodic assessment of timber output.** *Resour. Bull. NE-118*. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 28 p.

Evaluates timber output of Delaware. Results are based on a survey of the primary processing mills located in the state, and on mills in other states that used wood from Delaware. Contains statistics on industrial timber production and mill receipts, number of sawmills and lumber production, and the production and final end use of manufacturing residues. Comparisons are made between historical and current data, and trends in industrial wood output are noted.

Nolley, Jean W. 1991. **Bulletin of hardwood market statistics: fall 1990.** Res. Note NE-343. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 43 p.

Provides current and historical information on primary and secondary hardwood product production, prices, international trade, and employment.

Nolley, Jean W. 1991. **Bulletin of hardwood market statistics: winter 1990.** Res. Note NE-344. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 43 p.

Nolley, Jean W. 1991. **Bulletin of hardwood market statistics: spring 1991.** Res. Note NE-346. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 45 p.

Nolley, Jean W. 1991. **Bulletin of hardwood market statistics: summer 1991.** Res. Note NE-347. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 45 p.

Northeastern Forest Experiment Station and West Virginia University Extension Service. 1991. **Water in the forest.** Video. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 23:40 min.

Nowak, David J. 1991. **Analysis of an urban forest.** *Journal of Arboriculture*. 17(12): 334. Abstract.

Nowak, David J.; McBride, Joe R. 1991. **Comparison of Monterey pine stress in urban and natural forests.** *Journal of Environmental Management*. 32: 383-395. Monterey pine street trees within Carmel, California, and its immediate vicinity and forest-grown Monterey pine within adjacent natural stands were sampled with regard to visual

stress characteristics and various environmental and biological variables. Two stress indices were computed: one hypothesized before data collection was based on relative foliage retention and color; the other was derived through principal component analysis of 10 visual stress characteristics. Both indices were highly correlated. The more closed and generally denser forest stands led to increased plant competition that induced higher levels of stress for forest trees less than 50 cm in diameter compared with urban street trees of comparable diameters. Stress of urban trees generally increased with tree size due to increased internal shading of branches and loss of shade tolerance associated with aging.

ODell, Thomas M., comp. 1991. **Proceedings of the 23rd annual northeastern forest insect work conference; 1990 March 8-9; Albany, NY.** Syracuse, NY: State University of New York, College of Environmental Science and Forestry. 43 p.

Onken, Amy; Reardon, Richard C.; Mierzejewski, Karl. 1991. **The swath kit: new aircraft characterization tool.** NA-TP-02-91. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 2 p.

Parker, Bruce L.; Skinner, Margaret; Lewis, Trevor, eds. 1991. **Towards understanding Thysanoptera; 1989 February 21-23; Burlington, VT.** Gen. Tech. Rep. NE-147. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 464 p. Includes 31 papers and three posters on the systematics, biology, behavior and management of Thysanoptera, with particular reference to *Taeniothrips inconsequens* (Uzel), that were presented at an international conference in Burlington, Vermont.

Patterson, David W.; Hesterman, Nathan D.; Gatchell, Charles J. 1991. **Testing glueline continuity in standard-size hardwood blanks by mechanical methods.** Wood and Fiber Science. 23(2): 173-184. Glueline continuity is critical in standard-size hardwood blanks because the blanks are cut up into small furniture parts, and a small gap in the glueline of a blank may extend across the whole part, or a gap may appear as a crack in the final product. Strength is not a critical factor. The objective of this study was to determine whether a gap in a glueline can be detected by mechanical means. Furniture manufacturers want to be sure that any blank that they buy will have continuous gluelines. Every blank should be tested nondestructively, and all blanks with a defective glueline should be rejected from the shipment.

Patton, Roy L.; Jensen, Keith F.; Schier, George A. 1991. **Responses of red spruce seedlings to ozone and acid deposition.** Canadian Journal of Forest Research. 21(9): 1354-1359.

Red spruce seedlings were treated with ozone and simulated acid precipitation to determine the effects of these pollutants on growth, nonstructural carbohydrates, and foliar mineral content. One-year-old seedlings were fumigated with ozone (0.15 $\mu\text{L/L}$ for 6 hours a day or at 0.15 $\mu\text{L/L}$ for 6

hours a day plus 0.07 $\mu\text{L/L}$ for 18 hours a day) and treated with simulated precipitation (pH 3.5, 4.0, or 4.5) for up to 28 weeks. Seedlings were harvested at 7-week intervals. Ozone had no effect on growth, and precipitation acidity affected only terminal length. Carbohydrate pools were altered little by the ozone and precipitation treatments. Of eight minerals tested, only Ca was affected by precipitation acidity and only P and Cu were affected by ozone.

Peters, P. A. 1991. **Correlating production of accumulating feller-bunchers.** Transactions of the American Society of Agricultural Engineers. 34(3): 1024-1030.

The field performance of accumulating feller-bunchers reported in the United States and Canadian literature is reviewed. The major variables affecting feller-buncher performance in trees per productive machine hour (TPPMH) are average stand tree diameter at breast height (DBH), initial stand trees/ha (TPHA), and trees per accumulation (TPACC). The correlation between these variables is used to determine TPPMH as a linear function of DBH only. Slopes ranged from -6 to -25 TPPMH/DBH (trees/cm/hour) for the feller-bunchers considered. Accumulating feller-bunchers should be considered for use in stands with DBH of 15 to 30 cm; and shear or saw diameter should be 2 to 3 times DBH.

Peters, P. A. 1991. **Chainsaw felling fatal accidents.** Transactions of the ASAE. 34(6): 2600-2608.

Logging may be the most dangerous occupation and felling trees with a chain saw is the most dangerous of logging activities. The major cause of felling fatalities are a hangup fell, poor felling technique, butt rebound, broken limbs or tops, working too close, falling snag, and being struck from behind. Felling into standing timber accounted for 56 percent of the felling fatalities.

Peters, Penn A. 1991. **Hazards on the felling escape path.** In: McNeel, J. F.; Andersson, Bjorn, eds. Forestry operations in the 1990's; challenges and solutions. Proceedings of the 14th annual meeting of the Council on Forest Engineering; 1991 July 22-25; Nanaimo, B.C. [Place of publication unknown]: [Publisher name unknown]: 116-118.

Many fellers apparently have acted safely and yet were badly injured in a felling accident. A safe feller selects a direction of fall, puts in a notch cut to direct the tree, a back cut to fell the tree, and retreats on an escape path as the tree falls. But even when following these recommended safe practices, a feller on the escape path is still at risk! There are three types of accidents that can injure or kill a feller on the escape path: broken limbs or tops, butt rebound, and being struck from behind.

Peters, Penn A. 1991. **Mechanized felling on 40 to 100 percent slopes.** In: Proceedings of 1991 international winter meeting of American Society of Agricultural Engineers; 1991 December 17-20; Chicago, IL. Pap. No. 917545. St. Joseph, MI: American Society of Agricultural Engineers: 1-9.

Most wheeled and excavator-modified, tracked feller-bunchers are limited in operation to slopes of less than 30 percent. Some tracked feller-bunchers have been developed

for operation on slopes up to 70 percent. The ultimate carrier may be a walking robot that theoretically could negotiate 100 percent slopes. The current status of steep slope, feller-bunchers and walking robots is discussed.

Pierce, Robert S. 1991. **The United States experience in using experimental watersheds in acid rain research.** In: Rennie, P. J.; Robitaille, G., eds. Effects of acid rain on forest resources; 1983 June 14-17; Sainte Foy, PQ. Inf. Rep. DPC-X-35. Ottawa, ON: Forestry Canada: 353-354. Describes the acid rain research programs underway on forested experimental watersheds.

Podgwaite, John D. 1991. **GYPCHek use pattern realities.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 78. Abstract.

Podgwaite, John D. 1991. **Gypchek production in vivo.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 44. Abstract.

Podgwaite, John D.; Reardon, Richard C.; Kolodny-Hirsch, Douglas M.; Walton, Gerald S. 1991. **Efficacy of ground application of the gypsy moth (Lepidoptera: Lymantriidae) nucleopolyhedrosis virus product, Gypchek.** Journal of Economic Entomology. 84(2): 440-444.

Gypsy moth populations of low and medium density in eastern Maryland were treated with nucleopolyhedrosis virus product, Gypchek, using ground hydraulic equipment. A tank mix containing Orzan LS-50 (12 percent by volume) as a sunlight protectant, and Rhoplex B60A (2 percent by volume) as a sticker, was applied to six woodlots at the rate of 378 liters and 2.5×10^{12} polyhedral inclusion bodies per ha. This rate reduced numbers of egg masses by 81 percent compared with six control woodlots. Larval mortality was significantly higher in treated than in control woodlots, but defoliation differences between sprayed and control woodlots were not significant. Foliage collected 14 days after spray retained sufficient activity to kill up to 38 percent of gypsy moth larvae in laboratory bioassays.

Pouyat, Richard V.; McDonnell, Mark J. 1991. **The ecology and natural resources of New York City: a bibliography.** Occas. Publ. 5. Millbrook, NY: New York Botanical Garden, Institute of Ecosystem Studies. 121 p.

Includes a comprehensive list of references on the ecology and natural resources of New York City, and delineates the state of knowledge concerning the terrestrial and freshwater ecology of the region.

Pouyat, R. V.; McDonnell, M. J. 1991. **Heavy metal accumulations in forest soils along an urban-rural**

gradient in southeastern New York, USA. Water, Air and Soil Pollution. 57-58: 797-807.

Heavy metal contents of forest floor and mineral soil were determined in nine oak stands situated along an urban-rural gradient. Twelve composite soil and forest-floor samples from each stand were analyzed for seven metal cations. Levels of Cu, Ni, and Pb corresponded with the gradient. Mean concentrations of Pb in urban soil and forest floor were 4 times greater than in forests at the rural end of the gradient, whereas Cu and Ni were 2 times higher at urban sites.

Radloff, David; Loomis, Robert; Barnard, Joseph; Birdsey, Richard. 1991. **Forest health monitoring: taking the pulse of America's forests.** In: Agriculture and the environment: the 1991 yearbook of agriculture. Washington, D.C.: U.S. Department of Agriculture: 41-47. From a forest-resource management perspective, the goals of the Forest Health Monitoring (FHM) program are threefold: detect changes, evaluate possible causes of change, and increase our ability to anticipate or predict changes in forest resources. To achieve these goals, FHM consists of three interrelated monitoring activities: detection monitoring, evaluation monitoring, and intensive-site ecosystem monitoring.

Ravlin, F. William; Fleischer, S. J.; Carter, M. R.; Roberts, E. A.; McManus, M. L. 1991. **A monitoring system for gypsy moth management.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 89-97.

Within the last 10 years, considerable research has been directed toward the development of a gypsy moth monitoring system for project planning at a regional level and for making control decisions at a local level. Pheromones and pheromone-baited traps have been developed and used widely; several egg-mass sampling techniques also have been developed. These sampling techniques have been combined into a pheromone trap-based monitoring system that uses pheromone trap results to assist in prioritizing areas to receive egg-mass samples. The status of monitoring tools and systems for determining gypsy moth densities for management purposes and areas in need of continued research is discussed.

Roesch, Francis A., Jr.; Green, Edwin J.; Scott, Charles T. 1991. **Compatible basal area and number of trees estimators from remeasured horizontal point samples.** Forest Science. 37(1): 136-145.

Compatible groups of estimators for total value at time 1, survivor growth, and ingrowth for use with permanent horizontal point samples are evaluated for the special cases of estimating the change in both the number of trees and basal area.

Rowntree, Rowan A.; Nowak, David J. 1991. **Quantifying the role of urban forests in removing atmospheric carbon dioxide.** Journal of Arboriculture. 17(10): 269-275.

With increasing amounts of atmospheric carbon dioxide there has been a growing interest in understanding how much carbon urban forests store and sequester. This study estimates the total carbon stored and sequestered annually by urban forests in the United States; provides a methodology to enable urban foresters to estimate their own forest's carbon storage and sequestration; and estimates the number of trees necessary to compensate for carbon production at the organizational and individual level.

Russo, Joseph M.; Kelley, John G. W.; Liebhold, Andrew M. 1991. **Mesoscale landscape model of gypsy moth phenology.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 115. Abstract.

Scherzer, Amy Jo. 1991. **Effects of ozone and/or nitrate deposition on the growth and ecophysiology of sugar maple (*Acer saccharum*).** Columbus, OH: Ohio State University. 176 p. Ph.D. dissertation.

Schier, G. A.; McQuattie, C. J. 1991. **Aluminum toxicity in white pine seedling and the modulating effects of a mycorrhizal symbiont.** In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 33. Abstract.

Schlesinger, Richard C.; Funk, David T.; Roth, Paul L.; Myers, Charles C. 1991. **Pioneer mothers' memorial forest revisited.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 594-595.

Schuler, Thomas M.; Simpson, Brian T. 1991. **User's guide for Northeast Stand Exam program (NEST Version 2.1).** Gen. Tech. Rep. NE-149. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 15 p.

Explains the Northeast Stand Exam (NEST Version 2.1) program designed for use on the Polycorder 600 Series electronic portable data recorder to record data collected from the standard permanent plot as described by the Stand Culture and Stand Establishment working groups of the Northeastern Forest Experiment Station.

Sendak, Paul E. 1991. **Re-expressing interest rates estimated from the exponential model.** Northern Journal of Applied Forestry. 8(4): 172-173.

In financial analysis, the exponential model is a compound interest formula that relates present and future values. The model can be used to estimate the percentage rate of change in a time series such as reported timber stumpage prices. The exponential model implies that continuous

compounding and data series are typically reported monthly, quarterly, biannually, or annually. But often the analyst's goal is to estimate the annual percentage rate. Thus, the rate estimated by this model is for the wrong frequency and possibly period of compounding. The procedure for reexpressing the statistically estimated rate as an annual percentage rate is demonstrated.

Sendak, Paul E. 1991. **Timber sale value as a function of sale characteristics and number of bidders.** Res. Pap. NE-657. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7 p.

Examines the effect of sale characteristics and number of bidders on sale value for timber sold by sealed-bid auction on the Green Mountain National Forest in Vermont. As anticipated from theory and previous empirical studies, increasing the number of bidders tended to increase the winning-bid value for the timber auctions studied. Efforts made to ensure that a timber sale offering received at least one qualified bid had a greater impact on sales revenue than efforts made to increase high-bid value. In designing sales, managers should avoid setting the appraisal value too high in relation to timber quality.

Sendak, Paul E.; Martin, C. Wayne; Tritton, Louise M. 1991. **Using geographic information systems to manage northern hardwood stands.** In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 43-47.

A geographic information system is an efficient tool for organizing, analyzing, and displaying spatial data so that they can be used to best advantage for decisionmaking. A case study of a privately owned northern hardwood stand in Vermont that is showing symptoms of forest decline is presented.

Shields, Kathleen S.; Dougherty, Edward M. 1991. **Response of gypsy moth larvae to homologous and heterologous nuclear polyhedrosis virus.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 56 p. Abstract.

Sidle, Roy C.; Hornbeck, James W. 1991. **Cumulative effects: a broader approach to water quality research.** Journal of Soil & Water Conservation. 46(4): 268-271.

A variety of new studies and approaches could improve our understanding of cumulative watershed effects. Although many of these studies require a long-term commitment, management solutions derived from the research are not contingent upon completion of the entire program. Management guidelines such as the development of "thresholds of concern" for various environmental parameters can be updated with each new increment of information. Empirical studies of key watershed-response variables will provide useful management guidelines. As

more information is assimilated, process-oriented models could be developed to help land managers predict cumulative watershed effects.

Siemer, William F.; Batcheller, Gordon R.; Brown, Tommy L.; Glass, Ronald J. 1991. **Characteristics, motivations and involvement of trappers in New York**. HDRU Ser. 91-1. Ithaca, NY: Cornell University, Department of Natural Resources. 36 p.

Slavicek, James M. 1991. **Temporal analysis and spatial mapping of *Lymantria dispar* nuclear polyhedrosis virus transcripts and in vitro translation polypeptides**. *Virus Research*. 20: 223-236.

Genomic expression of the *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus (LdMNPV) was studied. Viral specific transcripts expressed in cell culture at various times from 2 through 72-hour postinfections were identified and their genomic origins mapped through Northern analysis.

Slavicek, James M. 1991. **Analysis of viral genomic heterogeneity in the *Lymantria dispar* nuclear polyhedrosis virus formulation Gypchek**. In: Haissig, Bruce E.; Kirk, T. Kent; Olsen, William L.; Raffa, Kenneth F.; Slavicek, James M., eds. Abstracts of papers presented at the international symposium on applications of biotechnology to tree culture, protection, and utilization. Gen. Tech. Rep. NE-152. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 131. Abstract.

Slavicek, James M. 1991. **Enhancement of *Lymantria dispar* nuclear polyhedrosis virus efficacy, potency, and polyhedra production in cell culture through biotechnology**. In: Proceedings of the 1991 annual gypsy moth review; 1991 November 4-7; Raleigh, NC. Raleigh, NC: National Gypsy Moth Management Board: 68-73.

Discusses approaches to the mitigation of LdNPV deficiencies and the generation of an enhanced LdNPV.

Slavicek, James M. 1991. **Enhancement of biological control agents for use against forest insect pests and diseases through biotechnology**. In: Technology 2001: the 2nd national technology transfer conference and exposition; 1991 December 3-5; San Jose, CA. NASA Conf. Publ. 3136. New York: Technology Utilization Foundation: 51-58.

Slavicek, James. 1991. **Genetically engineered organisms: recent applications of recombinant DNA technology to agents of microbial control**. In: Proceedings of the 23rd annual northeastern forest insect work conference; 1990 March 8-9; Albany, NY. Syracuse, NY: State University of New York, College of Environmental Science and Forestry: 14-16.

Slavicek, James M.; Hayes-Plazolles, Nancy. 1991. **Temporal analysis and spatial mapping of *Lymantria dispar* nuclear polyhedrosis virus transcripts and in vitro translation products**. In: Proceedings, U.S.

Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 52. Abstract.

Slavicek, James M.; Hayes-Plazolles, Nancy. 1991. **Identification, cloning, and expression analysis of three putative *Lymantria dispar* nuclear polyhedrosis virus immediate early genes**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 145. Abstract.

Slavicek, James M.; Lanner-Herrera, Carita; Hayes-Plazolles, Nancy; Kelly, Mary Ellen; Fikes, Martha. 1991. **Replication and inclusion body characteristics of two *Lymantria dispar* nuclear polyhedrosis virus plaque variants**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 54. Abstract.

Smith, Harvey R. 1991. **Understanding predation: implications toward forest management**. In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 146. Abstract.

Smith, H. Clay. 1991. **Managing hardwoods: alternative to single-tree selection—"how to."** In: Vodak, Mark C., ed. Uneven-aged management of hardwoods in the Northeast: proceedings of the conference; 1991 April 9-10; Lambertville, NJ. New Brunswick, NJ: Cook College-Rutgers University: 66-74.

Alternatives to single-tree selection are suggested for managing hardwood stands. It is assumed that alternative practices must leave a partial residual stand overstory at all times. Practices include modifications of diameter limits such as a financial maturity-improvement cutting practice. Two-age silviculture combined with crop-tree management is a possible alternative.

Smith, H. Clay; Miller, Gary W. 1991. **Releasing 75- to 80-year-old Appalachian hardwood sawtimber trees: 5-year d.b.h. response**. In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 402-413.

Mature trees on good growing sites are seldom thinned or released. Instead, the trees are harvested at maturity. Data were summarized from study areas in north-central West Virginia (northern red oak site index 70 feet and above) where mature trees were released on all sides of the crown

(full release). Information on 5-year d.b.h. growth and rates of return information indicate that several species respond to release. Yellow-poplar and northern red oak were the fastest growing species, averaging 1.8 and 1.6 inches d.b.h. It may be economical in some instances to retain mature trees for esthetics, seed production, and so on, while continuing to earn a good rate of return.

Smith, H. Clay; Miller, Gary W. 1991. **Deferment cutting in Appalachian hardwoods: the what, whys, and hows.** In: Uneven-aged silviculture of upland hardwood stands: workshop notes; 1991 February 25-27; Blacksburg, VA. Blacksburg, VA: Virginia Cooperative Extension Service and Virginia Polytechnic Institute and State University: 33-37.

Deferment cutting in Appalachian hardwoods can provide many of the silvicultural benefits from clearcutting while satisfying landowner objectives in selecting leave trees. Leaving some trees in a cutting area seems a necessary condition for public acceptance of even-age silvicultural practices.

Smith, Kevin T.; Shortle, Walter C. 1991. **Decay fungi increase the moisture content of dried wood.** In: Rossmore, H. W., ed. *Biodeterioration and biodegradation 8: proceedings of the 8th international biodeterioration and biodegradation symposium*; 1990 August 26-31; Windsor, ON. New York: Elsevier Applied Science: 138-146.

Presents three experiments that broaden the documented effect of decay fungi on the moisture content of wood and that suggest an additional mechanism by which fungi alter amounts of moisture in wood.

Smith, Paul M.; West, Cynthia D. 1991. **A strategic framework for globally-oriented wooden furniture manufacturers: an emphasis on South Korea.** In: Proceedings of an international symposium, international trade in forest products around the Pacific Rim: 1991 October 8-1; Seoul, Korea. Seattle, WA: University of Washington, College of Forest Resources.

Solomon, Dale S. 1991. **Modeling uneven-aged northern hardwoods.** In: Vodak, Mark C., ed. *Uneven-aged management of hardwoods in the Northeast: proceedings of the conference*; 1991 April 9-10; Lambertville, NJ. New Brunswick, NJ: Cook College-Rutgers University: 40-46.

Forest growth models applicable for managing uneven-aged northern hardwood stands are discussed. The available options and features of three models, FIBER, NE-TWIGS, and SILVAH, are compared. References are presented for forest managers to locate growth modeling information and for comparisons of model output.

Solomon, Dale S.; Leak, William B. 1991. **Migration of tree species in New England based on elevational and regional analyses.** In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 21. Abstract.

Stevens, Thomas H.; Echeverria, Jamie; Glass, Ronald J.; Hager, Tim; More, Thomas A. 1991. **Measuring the existence value of wildlife: what do CVM estimates really show?** *Land Economics*. 67(4): 390-400.

Examines the validity of the Contingent Valuation Method for estimating the existence value of four wildlife species recently introduced or reintroduced to New England: the bald eagle, Atlantic salmon, wild turkey, and coyote. Although the results are consistent with those obtained in previous studies, many respondents expressed moral beliefs and concerns about wildlife which raise several questions about the appropriate role of estimates of monetary existence value in benefit-cost analysis.

Stevens, T. H.; Glass, R.; More, T.; Echeverria, J. 1991. **Wildlife recovery: is benefit-cost analysis appropriate?** *Journal of Environmental Management*. 33: 327-334.

Benefit-cost analysis is likely to play an increasingly important role in decisionmaking with respect to the recovery and protection of endangered wildlife species. However, the results of a contingent valuation survey suggest that benefit estimates are sensitive to the method of aggregation and to how species are evaluated (separately or together). Many survey respondents believed that wildlife should not be valued in dollar terms, and a majority of those who were willing to pay for wildlife recovery exhibited behavior that appears inconsistent with economic theory.

Stout, Susan L. 1991. **Stand density, stand structure, and species composition in transition oak stands of northwestern Pennsylvania.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. *Proceedings, 8th central hardwood forest conference*; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 194-206.

Transition stands, those containing species associated with both the northern hardwood and oak-hickory forest types, are important to forest diversity in northwestern Pennsylvania. These stands have high value for forest uses such as timber production, wildlife habitat, and aesthetics. Diameter distributions are characteristically stratified by species, with the most valuable oak species among the largest trees in the stand. Understories typically consist of a mixture of northern hardwood species with those often found in the understory of true oak-hickory stands, for example, dogwood, blackgum, and cucumbertree. Diameter distributions for transition stands in northwestern Pennsylvania and their silvicultural implications are discussed, and density measures based on tree-area ratio and Reineke's stand-density index are reported.

Stout, Susan L. 1991. **Alternate management strategies reduce woody species diversity under heavy deer browsing pressure in northwestern Pennsylvania.** In: Proceedings of the conference on emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 43-47. Abstract.

Teck, Richard M.; Hilt, Donald E. 1991. **Individual tree-diameter growth model for the Northeastern United States**. Res. Pap. NE-649. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.

Describes a distance-independent individual-tree diameter growth model for the Northeastern United States. Diameter growth is predicted in two steps using a two-parameter, sigmoidal growth function modified by a one-parameter exponential decay function with species-specific coefficients. Coefficients are presented for 28 species groups. The model accounts for variability in annual diameter growth due to species, tree size, site quality, and the tree's competitive position within the stand. Model performance is evaluated using the mean predicted error and the root mean square error. Results are presented for the calibration data and an independent validation data set. The model has been incorporated into NE-TWIGS, a computerized forest growth model for the Northeastern United States.

Thompson, Ralph L.; Wade, Gary L. 1991. **Flora and vegetation of a 12-year-old coal surface-mined area in Rockcastle County, Kentucky**. *Castanea*. 56(2): 99-116. In 1987, a descriptive study of vascular flora and vegetation was conducted on a 12-year-old contour surface-mined area, the 2.5-ha Trace Branch site in Rockcastle County, Kentucky. An annotated list of vascular plants comprises 272 specific and infraspecific taxa (220 indigenous, 52 nonindigenous) from 63 families. These taxa consist of 13 Pteridophyta, 4 Pinophyta, and 255 Magnoliophyta. Numerically, the most important plant families were the Asteraceae (43), Poaceae (36), Fabaceae (25), Cyperaceae (11), and Rosaceae (11); 160 Rockcastle County distributional records were documented. *Hedeoma hispidum* Pursh, an endangered species in Kentucky, was present on the site. Plant communities were described on the bench, outslope, highwall, access road, and seasonally wet habitats. Twenty-four herbaceous and woody species (10 indigenous, 14 nonindigenous) of the 30 initially planted species have persisted. Vegetation consists of a complex mosaic of natural and semi-natural plant communities on unplanted and planted areas on the mined site.

Tkacz, Borys M.; Wallner, William E.; Goheen, Donald; Housley, Robert D.; Orr, Richard L.; Fons, James. 1991. **Pest risk assessment of the importation of larch from Siberia and the Soviet Far East**. Misc. Publ. 1495. Washington DC: U.S. Department of Agriculture, Forest Service. 280 p.

Tritton, Louise M.; Sendak, Paul E.; Martin, C. Wayne. 1991. **An interdisciplinary approach to managing northern hardwood stands**. In: The northern hardwood conference: emerging issues in northern hardwood management: air pollution, climate change & biodiversity; 1991 May 20-23; Mackinac Island, MI. Misc. Publ. 91-1. Houghton, MI: Michigan Technological University, Ford Forestry Center: 57-62.

A six-step interdisciplinary approach to managing northern hardwood stands that intergrates local site, regional, and global factors is described. An example of this procedure as applied to a northern hardwood stand in Vermont that

currently is managed as a sugarbush and showing symptoms of decline is presented.

Tubbs, Carl H.; Lamson, Neil. 1991. **Effect of shelterwood canopy density on sugar maple reproduction in Vermont**. *Northern Journal of Applied Forestry*. 8(2): 86-89.

To determine the best residual overstory density for sugar maple regeneration, five 3-acre blocks were established in northern hardwoods in Vermont. Three levels of shelterwood cutting were applied (30, 60, and 90 percent residual crown cover) along with clearcut and uncut treatments. Remeasurements after 8 years showed that a residual cover of 20 to 40 percent coupled with the removal of competing striped maple and ironwood saplings produced satisfactory numbers and height growth of sugar maple regeneration.

Turcotte, David E.; Smith, C. Tattersall; Federer, C. Anthony. 1991. **Soil disturbance following whole-tree harvesting in North-Central Maine**. *Northern Journal of Applied Forestry*. 8(2): 68-72.

Mechanical whole-tree harvesting can reduce site productivity if it results in excessive soil disturbance, which may both kill advanced regeneration and reduce the potential of the soil to support tree growth. Large feller-forwarders with wide, high flotation tires were designed to reduce soil disturbance, but they can cause excessive amounts of site disturbance if harvesting is conducted when soils are wet. The spatial distribution and severity of soil disturbance were determined on line transects after a spring whole-tree clearcut on silt loam soils in northern Maine. Exposed mineral soil and deep wheel ruts were more frequent on somewhat poorly (37 percent of surface area) and poorly (42 percent) drained soil than on moderately well-drained soil (19 percent). This amount of site disturbance seems excessive and could reduce future site productivity due to the removal of organic horizons and destruction of advanced conifer regeneration.

Turner, Robert; Newton, Carlton M.; Dennis, Donald F. 1991. **Economic relationships between parcel characteristics and price in the market for Vermont forestland**. *Forest Science*. 37(4): 1150-1162.

Twery, Mark J. 1991. **Effects of defoliation by gypsy moth**. In: Proceedings U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 27-39. Defoliation of trees by the gypsy moth has many and varied effects, including economic losses through lost forest production and reduced aesthetic qualities of the forest. Yet, defoliation can improve habitat for many species of wildlife and contribute to increased diversity of eastern forests. Effects on water resources, recreation, and other values differ with different levels of defoliation and different forest types. Primary and secondary effects of defoliation on forested ecosystems are reviewed.

Twery, Mark J. 1991. **Changes in vertical distribution of xylem production in hardwoods defoliated by**

- gypsy moth.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 147. Abstract.
- Twery, Mark J. 1991. **Understory composition of hardwood stands in north central West Virginia.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 601-602. Abstract.
- Twery, Mark J.; Elmes, Gregory A. 1991. **Hazard rating for gypsy moth on a Macintosh computer: a component of the GypsES system.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 63. Abstract.
- Twery, Mark J.; Elmes, Gregory A.; Yuill, Charles B. 1991. **Scientific exploration with an intelligent GIS: predicting species composition from topography.** *AI Applications*. 5(2): 45-52.
- Rule-based methods are a useful alternative framework for scientific investigation. The incorporation of intelligent functions in a geographic information system provides a means to generate new information. Rules to classify ridges and channels in a triangular irregular network model to estimate slope position demonstrate the usefulness of this framework. A study using these techniques in Arc/Info was conducted to predict forest cover type from topographic position. We can now determine whether species composition can be predicted from elevation and topographic position alone, or whether added geologic, pedologic, or hydrologic data are necessary in predicting species composition.
- Twery, Mark J.; Wargo, Philip M. 1991. **Development of a sampling system for *Armillaria* rhizomorphs in mixed oak stands: a progress report.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 128. Abstract.
- Tyree, Melvin T.; Ewers, Frank W. 1991. **The hydraulic architecture of trees and other woody plants.** *New Phytologist*. 119: 345-360.
- How the hydraulic design of trees influences the movement of water from roots to leaves is discussed. The hydraulic architecture of trees can limit their water relations, gas exchange throughout the crown of trees, the distribution of trees over different habitats and perhaps even the maximum height that a particular species can achieve. Parameters of particular importance include: (1) the vulnerability of stems to drought-induced cavitation events, i.e., cavitation reduces the hydraulic conductance of stems; (2) the leaf-specific conductivity of stems, which determines the pressure gradients and most negative water potentials needed to sustain evaporation from leaves; (3) the water-storage capacity of tissues, which might determine the ability of trees to survive long periods of drought.
- Tyree, Melvin T.; Snyderman, David A.; Wilmot, Timothy R.; Machado, Jose-Luis. 1991. **Water relations and hydraulic architecture of a tropical tree (*Schefflera morototoni*): data, models, and a comparison with two temperate species (*Acer saccharum* and *Thuja occidentalis*).** *Plant Physiology*. 96: 1105-1113.
- The water relations and hydraulic architecture of a tropical tree (*Schefflera morototoni*) and two temperate species (*Acer saccharum* and *Thuja occidentalis*) are reported. Among the water relations parameters measured were leaf and stem water-storage capacity, leaf-water potential, transpiration, and vulnerability of stems to cavitation and loss of hydraulic conductivity by embolisms. Among the hydraulic architecture parameters measured were hydraulic conductivity per unit pressure gradient, specific conductivity, leaf-specific conductivity, and Huber value. In terms of vulnerability of stems to cavitation, stem and leaf capacitances, and leaf-specific conductivity, all three species followed the same sequence: *Schefflera* > *Acer* > *Thuja*. It is argued here that the high stem capacitance and high leaf-specific conductivity of *Schefflera* are necessary to compensate for its high vulnerability to cavitation.
- Tyree, Melvin T.; Wescott, Charles R.; Tabor, Christopher A. 1991. **Diffusion and electric mobility of ions within isolated cuticles of *Citrus aurantium*.** *Plant Physiology*. 97: 273-279.
- A new method for measuring cation and anion permeability across cuticles of sour orange (*Citrus aurantium*) leaves is reported. The method requires the measurement of two electrical parameters: the diffusion potential arising when the two sides of the cuticle are bathed in unequal concentrations of a Cl⁻ salt, and the electrical conductance of the cuticle measured at a salt concentration equal to the average of that used in the diffusion-potential measurement. We also report an asymmetry in cuticle-conductance values depending on the magnitude and the direction of current flow. The asymmetry disappears at low current-pulse magnitude and increases linearly with the magnitude of the current pulse. This phenomenon is explained in terms of transport-number effects in a bilayer model of the cuticle.
- Valaitis, Algimantas P. 1991. **Characterization of hemolymph juvenile hormone esterase from *Lymantria dispar*.** *Insect Biochemistry*. 21(6): 583-595.
- Valaitis, Algimantas P. 1991. **Affinity purification of gypsy moth juvenile hormone esterase.** In: Haissig, Bruce E.; Kirk, T. Kent; Olsen, William L.; Raffa, Kenneth F.; Slavicek, James M., eds. Abstracts of papers presented at the international symposium on applications of biotechnology to tree culture, protection, and utilization. Gen. Tech. Rep. NE-152. Radnor, PA: U.S. Department

- of Agriculture, Forest Service, Northeastern Forest Experiment Station: 135. Abstract.
- Valaitis, Algimantas P. 1991. **Purification of trehalose-hydrolyzing enzyme from the musculature of the gypsy moth larvae.** In: Haissig, Bruce E.; Kirk, T. Kent; Olsen, William L.; Raffa, Kenneth F.; Slavicek, James M., eds. Abstracts of papers presented at the international symposium on applications of biotechnology to tree culture, protection, and utilization. Gen. Tech. Rep. NE-152. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 136. Abstract.
- Valaitis, Algimantas P.; Jollif, Joan. 1991. **Isolation and characterization of juvenile hormone esterase from gypsy moth (*Lymantria dispar*).** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 82. Abstract.
- Valaitis, A. P.; Kemp, R. G. 1991. **Purification and properties of gypsy moth larval 6-phosphofructo-1-kinase.** FASEB Journal. 5(6): 6599. Abstract.
- Valentine, Harry T.; Furnival, George M.; Gregoire, Timothy G. 1991. **Confidence intervals from single observations in forest research.** Forest Science. 37(1): 370-373.
A procedure for constructing confidence intervals and testing hypotheses from a single trial or observation is reviewed. The procedure requires a prior, fixed estimate or guess of the outcome of an experiment or sampling. Two examples of applications are described: a confidence interval is constructed for the expected outcome of a systematic sampling of a forested tract, and a hypothesis is tested in connection with a watershed experiment. Potential misuses of the procedure also are discussed.
- Varley, D.; Podila, G. K.; Hiremath, S. T. 1991. **Virulence factors of *C. parasitica*, the chestnut blight fungus.** In: Haissig, Bruce E.; Kirk, T. Kent; Olsen, William L.; Raffa, Kenneth F.; Slavicek, James M., eds. Abstracts of papers presented at the international symposium on applications of biotechnology to tree culture, protection, and utilization. Gen. Tech. Rep. NE-152. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 137. Abstract.
- Wade, Gary L.; Thompson, Ralph L. 1991. **The species-area curve and regional floras.** Transaction of Kentucky Academy of Science. 52(1-2): 21-26.
- Wade, Gary L.; Thompson, Ralph L. 1991. **Formula relates species richness and area to restoration success (Kentucky, Tennessee, Ohio, Virginia and West Virginia).** Restoration and Management Notes. 9(2): 124-125.
- Wallner, William. 1991. **Organisms posing risk.** Pest risk assessment of the importation of larch from Siberia and the Soviet Far East. Misc. Publ. 1495. Washington, DC: U.S. Department of Agriculture, Forest Service: 4-1 - 4-6.
- Wallner, William E.; Jones, Clive G.; Elkinton, Joseph S.; Parker, Bruce L. 1991. **Sampling low-density gypsy moth populations.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 40-44.
The techniques and methodology for sampling gypsy moth at low densities, less than 100 egg masses/ha are compared. Forest managers have constraints of time and cost, and need a simple predictable means to assist them in sampling gypsy moth populations. A comparison of various techniques coupled with results of recent habitat research studies indicates that a series of burlap banded trees can be used to monitor the change in egg-mass density over time. Egg masses beneath bands accurately reflect densities on unbanded trees, yet are easier to deploy and use and are less costly than other conventional methods. Habitat does not seem a major factor in determining the distribution of gypsy moth egg masses; however, forest stands selected for banding should have a major oak component.
- Wallner, William E.; Wagner, David L.; Parker, Bruce L.; Tobi, Donald R. 1991. **Bioecology of the conifer swift moth, *Korscheltellus gracilis*, a root feeder associated with spruce-fir decline.** In: Forest insect guilds: patterns of interaction with host trees; 1989 August 13-17; Abakan, Siberia, U.S.S.R. Gen. Tech. Rep. NE-153. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 199-204.
Describes studies to clarify the relationship of *K. gracilis* to its hosts, explain its apparent abundance in high-elevation forests, and increase information about its bioecology.
- Walters, Russell S. 1991. **Tree shelters for protecting planted red oak seedlings.** In: Majumdar, Shyamal K., ed. 67th annual meeting of the Pennsylvania Academy of Science; 1991 April 19-21; Wyomissing, PA. Philadelphia, PA: Pennsylvania Academy of Science: 209.
Maintenance of oak species and lack of oak regeneration is a major silvicultural problem in many upland oak forests of the Eastern United States. This problem is even greater in northwestern Pennsylvania because of browsing by large populations of white-tailed deer. Tree shelters are rigid, translucent, plastic tubes (10 to 15 cm in diameter and 1.2 to 1.8m tall) placed around individual seedlings to protect them from browsing. This study is evaluating the influence of tree shelters on height growth and survival of planted northern red oak seedlings and seedlings from planted acorns. After the first growing season, planted seedlings with no protection had an average height of 49 cm with 96 percent survival; seedlings planted in tree shelters had an average height of 54 cm with 93 percent survival. Only 2 percent of the acorns planted without shelters produced seedlings compared to 32 percent inside shelters.
- Wang, Y. S.; Welles, J.; Miller, D. R.; Anderson, D. E.; Heisler, G.; McManus, M. 1991. **Architecture of the**

- Black Moshannon forest canopy measured by hemispherical photographs and a LI-COR LAI-2000 sensor.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 149. Abstract.
- Wargo, Philip M. 1991. **Remarks on the physiological effects of defoliation on sugar maple and some impacts on syrup production.** In: Parker, Bruce L.; Skinner, Margaret; Lewis, Trevor, eds. *Towards understanding Thysanoptera*; 1989 February 21-23; Burlington, VT. Gen. Tech. Rep. NE-147. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 241-250.
Describes the effects of defoliation on sugar maple and some of the factors we need to understand about defoliation to anticipate its various effects.
- Wargo, Philip M.; Haack, Robert A. 1991. **Understanding the physiology of dieback and decline diseases and its management implications for oak.** In: Laursen, Steven B.; DeBoe, Joyce F., eds. *The oak resource in the upper Midwest: implications for management: conference proceedings*; 1991 June 3-6; Winona, MN. Publ. NR-BU-5663-S. St. Paul, MN: University of Minnesota: 147-158.
Management implications of dieback and decline diseases are unique because they are triggered by abiotic and biotic stress events that may disappear long before their effects in the forest are apparent through interactions with opportunistic secondary organisms. In oak forests, management options must focus on preventing biotic stress and reducing both types of stress by increasing stand and tree resistance both to the occurrence and effects of stress. Such management activities would reduce the impact of *Armillaria* spp. and the twolined chestnut borer, the two major mortality agents in oak decline.
- Wargo, Philip M.; Harrington, Thomas C. 1991. **Host stress and susceptibility.** In: Shaw, Charles G., III; Kile, Glen A., eds. *Armillaria root disease*. Agric. Handb. 691. Washington, DC: U.S. Department of Agriculture: 88-101.
- Webb, R. E.; Shapiro, M.; Podgwaite, J. D. 1991. **Field confirmation of potentiation of a baculovirus by an optical brightener.** In: Programs and abstracts, 25th annual meeting of the Society for Invertebrate Pathology; 1992 August 16-21; Heidelberg, Germany. [Place of publication unknown]; [Publisher name unknown]. Abstract.
- Webb, R. E.; Shapiro, M.; Podgwaite, J. D.; Cohen, D. D.; Ridgway, R. L. 1991. **Evaluation of the abington isolate of the gypsy moth nuclear polyhedrosis virus against a formulation of Gypchek in small field plots.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 77. Abstract.
- Weilbourn, W. Calvin; Jennings, Daniel T. 1991. **Two new species of Erythraeidae (Acari: Prostigmata) associated with the spruce budworm, *Choristoneura fumiferana* (Clemens) (Lepidoptera: Tortricidae), in Maine.** Canadian Entomologist. 123: 567-580.
Two new species of the mite family Erythraeidae (Acari: Prostigmata: Parasitengona) found associated with the spruce budworm, *Choristoneura fumiferana* (Clemens) (Lepidoptera: Tortricidae), in Maine are described. Larvae of *Leptus treati* sp. nov. parasitize spruce budworm adults. *L. treati* is the first member of the genus to have both larval and postlarval instars described. Adults of *Balaustium kendalli* sp. nov. prey on spruce budworm eggs; *B. kendalli* is only the second member of the genus to have both larval and postlarval instars described.
- Warren, John H.; Odell, Thomas. 1991. **Use of molecular probes to detect parasites and retrotransposons in gypsy moths.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 84. Abstract.
- West, Cynthia D. 1991. **An analysis of international trade in hardwood chips.** In: Competing for today's world markets: FPRS 45th annual meeting; 1991 June 23-26; New Orleans, LA. Madison, WI: Forest Products Research Society: 43. Abstract.
- West, Cynthia D.; Bahn, Kenneth D.; Sinclair, Steven A. 1991. **Competitive policy paradigm of technology adoption: an empirical investigation.** In: Chapman, Richard L.; Sharp, William R., eds. *Proceedings, preparing the way: technology transfer in the 21st century*; 1991 June 9-11; Denver, CO. Indianapolis, IN: Technology Transfer Society: 318-332.
- West, Cynthia D.; Sinclair, Steven A. 1991. **Technological assessment of the wood household furniture industry.** Forest Products Journal. 41(4): 11-18.
Implementation of state-of-the-art technologies is one strategy to increase a firm's competitive position. Innovative manufacturing technologies can improve product quality, reduce manufacturing costs, and/or provide better customer service. The U.S. wood household-furniture industry currently faces stiff competition from abroad; in 1986, imports claimed 22.6 percent of consumption. U.S. furniture producers have been criticized for failing to implement new processing technologies that might improve their competitive situation. The technological situation within this industry is evaluated through primary data collection on plans for technology adoption and equipment purchase. Respondents listed purchases of finish machining equipment as providing the greatest benefits in increasing efficiency and product quality. About half of this equipment was numerically controlled or computer numerically controlled.
- Wharton, Eric H. 1991. **Fuelwood telephone surveys: how accurate are they?** Northern Journal of Applied Forestry. 8(3): 119-122.

To obtain fuelwood information in the Northeast, the Northeastern Forest Experiment Station contacts forest-land owners who have harvested fuelwood or allowed fuelwood to be harvested from their land. Results from a study of the accuracy of these responses indicate that forest-land owners can roughly estimate the volume of fuelwood that was harvested from their land, but do not know the kinds of trees harvested or the type of forest land from which the trees were harvested.

Widmann, Richard H. 1991. **Hardwoods are now being harvested at record levels.** In: McCormick, Larry H.; Gottschalk, Kurt W., eds. Proceedings, 8th central hardwood forest conference; 1991 March 4-6; University Park, PA. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 603. Abstract.

Widmann, Richard H. 1991. **Pulpwood production in the Northeast—1989.** Resour. Bull. NE-119. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 28 p.

Contains 1989 information compiled from a canvass of all pulp mills that use pulpwood produced in the 14 northeastern states. Includes data on pulpwood production and consumption from roundwood by county and species group, and on pulpwood chip production from manufacturing residues by state. Comparisons are made with previous year's data.

Williams, Roger N.; Galford, Jimmy R.; Purrington, Foster F. 1991. **Parasites of *Stelidota* (Coleoptera: Nitidulidae).** Entomological News. 102(2): 90-94.

Witter, John A.; Montgomery, Michael E.; Chilcote, Charley A.; Stoyenoff, Jennifer L. 1991. **The effects of tree species and site conditions on gypsy moth survival and growth in Michigan.** In: Proceedings, U.S. Department of Agriculture interagency gypsy moth research review 1990; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 47. Abstract.

Wood, Peter S.; Butler, Linda. 1991. **Biology of *Morrisonia confusa* (Noctuidae).** Journal of Lepidopterists' Society. 45(3): 197-203.

Studies on *Morrisonia confusa* were conducted in 1984 and 1985 in the laboratory and at Cooper's Rock State Forest in northern West Virginia. The adult flight period was from May 2 to June 8, and larvae were collected from June 6 to September 20. Nineteen host plants and 15 species of parasites are recorded for *M. confusa* larvae. Larval duration averaged 71.4 days at 24°C. The egg and seven larval instars are described.

Woods, S. A.; Elkinton, J. S.; Murray, K. D.; Liebhold, A. M.; Gould, J. R.; Podgwaite, J. D. 1991. **Transmission dynamics of a nuclear polyhedrosis virus and predicting mortality in gypsy moth (Lepidoptera: Lymantriidae) populations.** Journal of Economic Entomology. 84(2): 423-430.

Mortality from nuclear polyhedrosis virus (NPV) among gypsy moth, *Lymantria dispar* (L.), neonates hatched from field-collected egg masses and larvae collected from the field was monitored at study sites in Massachusetts from 1983 through 1987. Mortality and prevalence of NPV were related to six potential predictor variables that could be obtained before egg hatch occurred in the field. These variables were calculated from egg-mass density, the number of larvae hatching from egg masses, and the proportion of infection among hatching larvae. Logistic regression analyses suggest that transovum transmission is density-independent after an epizootic, whereas larva-to-larva transmission remains density-dependent. Differences may be due to the persistence of NPV on surfaces through which transmission is mediated.

Yaussy, Daniel A. 1991. **Tree, log, and lumber quality models for eastern hardwoods.** In: Pacific Rim forestry--bridging the world: proceedings of the 1991 Society of American Foresters national convention; 1991 August 4-7; San Francisco, CA. SAF Publ. 91-05. Bethesda, MD: Society of American Foresters: 99-106.

Different methods of quantifying hardwood tree, log, and lumber quality are reviewed. The difficulties inherent in modeling hardwood quality using the discrete grade classifications are discussed. A continuous variable for measuring quality, composed of a count of defects and tree size, is suggested; possibilities for its use with a white oak data set are explored.

Yaussy, Daniel A. 1991. **Upland oak growth and yield simulator thinning routine influenced by grade.** In: Payandeh, Bijan, ed. Proceedings, Midwest forest mensurationists, Great Lakes growth and yield cooperative and Forestry Canada modeling working group joint workshop; 1991 August 20-23; Sault Ste. Marie, ON. Ottawa, ON: Forestry Canada: 61-68.

Generalized logistic regression was used to distribute trees into four potential tree grades for three upland oak species groups: white oak, black oak, and other tree species. The potential tree grade is defined as the USDA Forest Service grade that a tree likely will achieve when it grows into the 16-inch-diameter class. The methods were then incorporated into OAKSIM, an upland oak, even-aged, individual-tree growth and yield simulator. The thinning algorithm in OAKSIM was modified to favor the higher quality trees in each diameter class. Results from the simulator are compared to actual stands marked for thinning.

Yaussy, Daniel A.; Dale, Martin E. 1991. **Merchantable sawlog and bole-length equations for the Northeastern United States.** Res. Pap. NE-650. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7 p.

A modified Richards growth model was used to develop species-specific coefficients for equations that estimate the merchantable sawlog and bole length of trees from 25 species groups common to the Northeastern United States. These regression coefficients have been incorporated into NE-TWIGS, the growth-and-yield simulation software.

Zipperer, Wayne C.; Andersen, Carol G. 1991. **An assessment of residential development in a rural community.** In: Technical papers from the 1991 ACSM-ASPRS annual convention. Bethesda, MD: American Congress on Surveying and Mapping and American Society for Photogrammetry and Remote Sensing: 257-263.

To determine whether residential development in a rural area occurred on sites suitable for construction, we compared a derived suitability map with actual residential patterns using pcARC/INFO. A land-use map was developed for the study area (Jackson, New Hampshire) to delineate residential sites. Land-use categories included agriculture, forest, open, recreation, commercial, and residential. Physical suitability for residential construction was derived by creating a composite map of soils, slope, hydrology, and zoning ordinances. Comparison of this map with the land-use map showed that residential development did not occur typically in areas suitable for construction.

Zipperer, W. C.; Rowntree, R. A.; Stevens, J. C. 1991. **Structure and composition of streetside trees of residential areas in the State of Maryland, U.S.A.** *Arboricultural Journal*. 15: 1-11.

The composition and structure of streetside trees in residential areas were surveyed for three Maryland counties: Wicomico, Prince Georges, and Anne Arundel. In the rapidly developing county of Prince Georges, streetside trees were dominated by non-native species. Anne Arundel County, with moderate urban growth, had a higher percentage of native species than Prince Georges, but a lower percentage than Wicomico. In the slowly developing county of Wicomico, native species dominated.

Publications--1992

Aber, John D.; Federer, C. Anthony. 1992. **A generalized, lumped-parameter model of photosynthesis, evapotranspiration and net primary production in temperate and boreal forest ecosystems.** *Oecologia*. 92: 463-474.

A simple, monthly time-step model of water and carbon fluxes that makes use of these relationships (PnET) is presented and applied to 10 temperate and boreal forest ecosystems. The model minimizes the number of input parameters required but captures important interactions between nitrogen availability (as represented by foliar N concentrations) and leaf physiology as they affect photosynthesis and transpiration.

Adams, Edward L. 1992. **USDA offers help for evaluating CNC woodworking equipment.** *Woods & Wood Products*. 97(1): 76-77.

Describes evaluation procedures that help both the seller and the buyer of CNC woodworking equipment determine the best machine for a given production situation.

Adams, Edward L. 1992. **CAD/CAM in the furniture industry.** In: Yeh, M. C.; Wang, H. H.; Chiang, C. L., eds. *Proceedings, knowledge-based expert system for the furniture industry.* [Place of publication unknown]: [Publisher name unknown]: 3-1 - 3-13.

Discusses procedures required to use computer aided design (CAD) and computer aided manufacturing (CAM) systems for designing furniture parts and manufacturing them on CNC routers. Steps for purchasing these CAD/CAM systems are given.

Adams, Edward L.; Rast, Everette D. 1992. **Evaluation procedure for CNC woodworking machinery.** In: *Technologies for competitive growth in West Virginia; 1992 October 28; Shepherdstown, WV. Morgantown, WV: Software Valley Foundation: 11-12.*

To help solve the communication problem between buyers and sellers of CNC woodworking equipment, researchers at the Advanced Hardwood Processing and Technical Resource Center of the USDA Forest Service at Princeton, West Virginia, are developing procedures for equipment evaluation that can be used by every company that buys or sells CNC equipment in the secondary wood-processing industry.

Adams, Mary Beth; Eagar, Christopher. 1992. **Impacts of acidic deposition on high-elevation spruce-fir forests: results from the Spruce-Fir Research Cooperative.** *Forest Ecology and Management*. 51: 195-205.

Large numbers of standing red spruce trees in high-elevation spruce-fir forests of the northeastern United States coupled with nearly synchronous decreases in radial growth have been linked with elevated levels of air pollutants. These high-elevation forests receive a significant amount of sulfate and nitrate from cloud-water deposition. The Spruce-Fir Research Cooperative, an integrated multi-institutional research program, is investigating hypothesized effects of acidic deposition on the spruce-fir forests. These include: (1) soil-mediated effects, (2) altered physiological processes, (3) increased foliar injury, (4) increased susceptibility to winter injury.

Adams, M. B.; Turner, R. S.; Schmoyer, D. D. 1992.

Evaluation of direct/delayed response project soil sampling classes: northeastern United States. *Soil Science Society of America Journal*. 56(1): 177-187.
The Direct/Delayed Response Project identified about 600 soils on 145 watersheds in the northeastern United States. Soils were assembled into 38 sampling classes based on soil characteristics thought to influence surface water chemistry. Multivariate analysis was used to evaluate the utility of the sampling classes. Hydrologic and chemical properties of soils were determined to be the most important for discriminating among sampling classes. Although sampling class was a statistically significant effect for most soil chemistry variables, only a few classes were distinct (some Entisols, Histosols, and Inceptisols with high base saturation).

Anderson, D. E.; Miller, D. R.; Wang, Y. S.; Mierzejewski, K.; Yendol, W. G.; McManus, M. L. 1992.

Measurements of the micrometeorology affecting above and within canopy deposition of spray from aircraft in mountainous terrain. In: Gottschalk, Kurt W.; Twery, Mark J., eds. *Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 26. Abstract.*

Anderson, Dean E.; Miller, David R.; Yendol, William G.; Mierzejewski, Karl; McManus, Michael L. 1992. **FSCBG model evaluation over an oak forest.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. *Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 27. Abstract.*

Anderson, Dean E.; Miller, David R.; Wang, Yansen; Yendol, William G.; Mierzejewski, Karl; McManus, Michael L. 1992. **Deposition of aerially applied Bt in an oak forest and its prediction with the FSCBG model.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. *Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 8. Abstract.*

Anderson, Dean E.; Miller, David R.; Wang, Yansen; Yendol, William G.; Mierzejewski, Karl; McManus, Michael L. 1992. **Deposition of aerially applied Bt in an oak forest and its prediction with the FSCBG model.** *Journal of Applied Meteorology*. 31(12): 1457-1466.

Anderson, R. Bruce. 1992. **How to justify CNC equipment.** *Furniture Design & Manufacturing*. 64(4): 38, 40, 42, 44.

Woodworking manufacturers who want to develop more versatile, flexible production facilities need to invest in automated or computer numerically controlled equipment. CNC equipment is a complex addition to wood products

manufacturing. Integrating this new technology into the manufacturing process requires a broad assessment of its impact.

Auchmoody, L. R. 1992. Impact of liming on forest soil chemical properties. Agronomy Abstracts. 343.

Dolomitic limestone was broadcast at 22.4 mg ha⁻¹ on the forest floor of maturing Allegheny hardwood stands in northwestern Pennsylvania during autumn 1985. Sixteen 0.2-ha plots were limed and 16 plots were not limed. Soil samples were collected annually from each of the 32 plots 1 year after the lime application for 4 years. Samples were taken by 2.5-cm increments to a soil depth of 15 cm and were analyzed for pH, Al, P, K, Ca, Mg, Na, and Mn. Liming increased soil pH, Ca, and Mg and decreased Al and Mn concentrations. These effects increased over time and diminished with increasing soil depth. Liming also decreased P, K, and Na concentrations in the surface 2.5 cm of soil, but had minor effects at deeper depths.

Auchmoody, L. R. 1992. Biotic limitations to red oak regeneration. In: 19th annual natural areas conference: rediscovering America; 1992 October 27-30; Bloomington, IN. Bloomington, IN: Indiana University: 3. Abstract.

After 4 years of study it was determined that the major causes for the failure of red oak to reproduce were the low number of advance red oak seedlings in the parent stands, small seedling size, and intense competition from other faster growing hardwoods that quickly outgrow and overtop red oak seedlings that are present.

Auchmoody, L. R.; Walters, Russell S. 1992. Impact of deer browsing, overstory density, and competition as survival and development of planted northern red oak seedlings. In: Thompson, Janette R.; Schultz, Richard C.; Van Sambeek, J. W., eds. 5th workshop on seedling physiology and growth problems in oak plantings; 1992 March 4-5; Ames, IA. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 1. Abstract.

Bailey, Scott W.; Hornbeck, James W. 1992. Lithologic composition and rock weathering potential of forested, glacial-till soils. Res. Pap. NE-662. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7 p.

Describes methods for predicting lithologies present in soils developed on glacial till, and the potential weathering contributions from rock particles more than 2 mm in diameter. The methods are not quantitative in providing weathering rates but do provide information that can broaden our understanding of forest nutrient cycles and possibly assist with decisions about forest harvesting.

Baker, F. A.; Shaw, C. G., III; Omdal, D. W.; Wargo, P. M. 1992. Evaluation of the root disease indicator used in the forest health monitoring program. Phytopathology. 82(10): 1152. Abstract.

Barger, Jack H.; Hall, Richard W.; Townsend, Alden M. 1992. Elm leaf beetle performance on ozone-fumigated elm. Res. Pap. NE-661. Radnor, PA: U.S. Department of

Agriculture, Forest Service, Northeastern Forest Experiment Station. 9 p.

Leaves from elm hybrids ('Pioneer', 'Homestead', '970') previously fumigated in open-top chambers with ozone or with charcoal-filtered air (CFA) were evaluated for water and nitrogen content or were fed to adult elm leaf beetles (ELB), *Xanthogaleruca = (Pyrrhalta) luteola* (Muller), to determine host suitability for beetle fecundity and survivorship. ELB females fed ozone-fumigated leaves laid significantly fewer eggs than females fed CFA-fumigated leaves. Leaf nitrogen or water content was unaffected. Hybrid '970' was fumigated with CFA or with ozone concentrations to determine effects on ELB fecundity, leaf consumption, and survivorship. Significantly fewer eggs were laid at the higher concentration of ozone.

Baumgras, J. E.; LeDoux, C. B. 1992. Software to estimate timber harvesting cost and revenue for eastern hardwoods. In: American forestry--an evolving tradition. Proceedings of the 1992 Society of American Foresters national convention; 1992 October 25-28; Richmond, VA. SAF Publ. 92-01. Bethesda, MD: Society of American Foresters: 573-574.

Large variations in timber harvesting cost and revenue result from the differences between harvesting systems, the variable attributes of harvesting sites and timber stands, or changing product markets. Computer software providing site- and system-specific estimates of harvesting cost and revenue include ECOST, PROFIT-PC, THIN, and GB-SIM. This software provides information needed to identify appropriate harvesting technology for specific applications, and information on cash flow needed to evaluate forest management alternatives.

Baumgras, John E. 1992. Effects of silvicultural prescriptions and roundwood markets on the economic feasibility of hardwood thinnings. In: The future of multiple use in eastern hardwood forests. Proceedings, 20th annual symposium of the Hardwood Research Council; 1992 June 1-3; Cashiers, NC. Memphis, TN: Hardwood Research Council: 131-142.

Because forest-land owners often are reluctant to invest in precommercial thinnings, it is important to evaluate the effects of silvicultural prescriptions and roundwood markets on the economic feasibility of commercial thinnings in hardwood stands. Cash flows from thinning upland oak stands were estimated for thinnings at age 30 to 70 years, with residual stocking levels of 45 to 75 percent. This analysis was conducted with simulations of forest growth and timber harvesting systems, and prices for roundwood products. Under most conditions, it was not feasible to thin before age 50. At ages 50 to 70 years, thinning cash flows ranged from \$-61/acre to \$513/acre depending on age at thinning, residual stocking, and roundwood markets.

Baumgras, John E.; LeDoux, Chris B. 1992. Computer software to estimate timber harvesting system production, cost, and revenue. Compiler. 10(4): 28-32.

Beltz, Roy C.; Cost, Noel D.; Kingsley, Neal P.; Peters, John R. 1992. Timber volume distribution maps for the

Eastern United States. Gen. Tech. Rep. WO-60. Washington, DC: U.S. Department of Agriculture, Forest Service. 59 p.

Maps show the distribution of growing stock and sawtimber volume for the 26 most important timber species and species groups in the Eastern United States. Volumes per acre of timberland are depicted by county. The maps should be particularly helpful to woods users who are trying to determine where volumes of important species are concentrated.

Bernon, G. J.; Tardif, J. G. R.; Hansen, R. W.; Podgwaite, J. D. 1992. **Production of gypsy moth nuclear polyhedrosis virus (NPV).** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 30. Abstract.

Birch, Thomas W. 1992. **Land ownership and harvesting trends in eastern forests.** In: The future of multiple use in eastern hardwood forests. Proceedings, 20th annual hardwood symposium of the Hardwood Research Council; 1992 June 1-3; Cashiers, NC. Memphis, TN: Hardwood Research Council: 143-157.

Recently completed forest inventories and surveys of forest owners in 10 Northeastern States have given us insight into contemporary harvesting activities in the region. About 46 percent of the private owners have harvested timber from their holding at some time in the past. This is nearly double the number of owners who had harvesting experience a decade earlier. Owners have developed a more positive attitude toward timber cutting at a time when there is greater demand for products from the resource. Short-term economics rather than textbook silviculture may determine the kind of cutting that takes place. Owner intentions to harvest along with a maturing forest have created a situation in which timber volume is available for industrial expansion.

Birch, Thomas W.; Gansner, David A.; Arner, Stanford L.; Widmann, Richard H. 1992. **Cutting activity on West Virginia timberlands.** Northern Journal of Applied Forestry. 9(4): 146-148.

A recent forest inventory and survey of woodland owners provide insight into contemporary cutting activities in West Virginia. About one-third of the private woodland owners have harvested timber from their holdings at some time in the past; they control two-thirds of the private timberland. Timber harvesting has increased in recent years but remains a concentrated activity. Remeasured plot data show that only 24 percent of the timberland had cutting disturbance between the last two inventories. Four-fifths of the cutting took place on one-tenth of the timberland. The timber resource is ripe for more cutting, landowner attitudes have changed to favor increased harvesting, and government initiatives support a climate for timber development.

Birdsey, Richard A. 1992. **Impacts of forest management policy on carbon storage in U.S. forests.** In: Adams,

Darius; Haynes, Richard; Lipke, Bruce; Perez-Garcia, John, comps. Forest sector, trade and environmental impact models: theory and applications: Proceedings of an international symposium; 1992 April 30-May 1; Seattle, WA. Seattle, WA: University of Washington: 70-77.

Estimates of changes in carbon storage over long periods under alternative assumptions about the future can be made with a carbon budget model that has been integrated with econometric models of the forest sector. The integrated model can assess: (1) potential impacts of trends in U.S. forest resources on the global carbon cycle, (2) effects of global change on forest resources and society, and (3) effects of mitigation and adaptation responses to global changes on forest resources, the carbon cycle, and society.

Birdsey, Richard A. 1992. **Carbon storage and accumulation in United States forest ecosystems.** Gen. Tech. Rep. WO-59. Washington, DC: U.S. Department of Agriculture. 51 p.

Brooks, Robert T.; Barnard, Joseph E.; Burkman, William G. 1992. **Detection-level forest health monitoring in the United States, 1990-1991.** In: Tesche, M.; Feiler, S., eds. Proceedings, air pollution and interactions between organisms in forest ecosystems: IUFRO 15th international meeting of specialists in air pollution effects on forest ecosystems; 1992 September 9-11; Germany. Dresden, Germany: Technische Universität Dresden: 54-58.

Brooks, Robert T.; Dickson, David R.; Burkman, William B.; Millers, Imants; Miller-Weeks, Margaret; Cooter, Ellen; Smith, Luther. 1992. **Forest health monitoring in New England: 1990 annual report.** Resour. Bull. NE-125. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 111 p. The USDA Forest Service in cooperation with the U.S. Environmental Protection Agency and New England state forestry agencies initiated field sampling for the Forest Health Monitoring program in 1990. In all, 263 permanent sample plots were established. Measurements were taken to characterize the physical conditions of the plots. Results of first-year measurements of tree-crown condition, tree damage, and bioindicator plants are reported. Also discussed is the status of major forest stressors during 1990, including forest insects and pathogens, atmospheric deposition and pollution, and climate and weather.

Brooks, Robert T.; Frieswyk, Thomas S.; Griffith, Douglas M.; Cooter, Ellen; Smith, Luther. 1992. **The New England forest: baseline for New England forest health monitoring.** Resour. Bull. NE-124. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 89 p.

The USDA Forest Service along with various cooperators has initiated Forest Health Monitoring (FHM) in New England to assess the condition and stressors of the region's forests, to analyze changes in these data over time, and to identify any relationships between forest condition and stressors. A major component of FHM in New England is 263 permanent plots located across the region on which growth efficiency, foliar condition and nutrition, soil nutrition, and landscape characteristics will be measured and reported annually.

- Cameron, E. Alan; McCormick, Larry H.; Teulon, David A. J.; Kolb, T. E., eds. 1992. **The 1991 conference on thrips (Thysanoptera): insect and disease consideration in sugar maple management**; 1991 November 21-22; University Park, PA. Gen. Tech. Rep. NE-161. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 59 p. Addresses entomological and management components of insect and disease consideration in sugar maple management. Oral and poster presentations explored and expanded on many of the facets of management of a forest resource, with particular reference to Thysanoptera and the role they may play.
- Cannon, W. N., Jr.; Barger, J. H.; Hall, R. W. 1992. **Growth response of gypsy moth larvae to CO₂-fumigated white oak foliage**. Ohio Journal of Science. 92(2). Abstract.
- Carter, M. R.; Ravlin, F. W.; McManus, M. L. 1992. **Effect of defoliation on gypsy moth phenology and capture of male moths in pheromone-baited traps**. Population Ecology. 21(6): 1308-1318.
- Chambers, Jeanne C.; MacMahon, James A.; Wade, Gary L. 1992. **Differences in successional processes among biomes: importance in obtaining and evaluating reclamation success**. In: Chambers, Jeanne C.; Wade, Gary L., eds. Evaluating reclamation success: the ecological consideration--proceedings of a symposium; 1990 April 23-26; Charleston, WV. Gen. Tech. Rep. NE-164. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 59-72.
- Chambers, Jeanne C.; Wade, Gary L., eds. 1992. **Evaluating reclamation success: the ecological consideration--proceedings of a symposium**; 1990 April 23-26; Charleston, WV. Gen. Tech. Rep. NE-164. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 107 p. Includes 10 papers from a symposium organized to review what is known about the ecological principles that will govern the ultimate success or failure of all reclamation efforts on drastically disturbed lands. The papers cover four general areas: soil biological properties and nutrient cycling, vegetation dynamics; animal recolonization; and landscape-scale processes.
- Chambers, Jeanne C.; Wade, Gary L. 1992. **Evaluating reclamation success using ecological principles: a holistic approach**. In: Chambers, Jeanne C.; Wade, Gary L., eds. Evaluating reclamation success: the ecological consideration--proceedings of a symposium; 1990 April 23-26; Charleston, WV. Gen. Tech. Rep. NE-164. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 105-107.
- Chilcote, Charley A.; Witter, John A.; Montgomery, Michael E.; Stoyenoff, Jennifer L. 1992. **Intra- and inter-clonal variation in gypsy moth larval performance on bigtooth and trembling aspen**. Canadian Journal of Forest Research. 22: 1676-1683.
- Cochard, Herve; Cruziat, Pierre; Tyree, Melvin T. 1992. **Use of positive pressures to establish vulnerability curves: further support for the air-seeding hypothesis and implications for pressure-volume analysis**. Plant Physiology. 100: 205-209. Loss of hydraulic conductivity occurs in stems when the water in xylem conduits is subjected to sufficiently negative pressure. According to the air-seeding hypothesis, this loss of conductivity occurs when air bubbles are sucked into water-filled conduits through micropores adjacent to air spaces in the stem. Results of this study showed that the loss of hydraulic conductivity occurred in stem segments pressurized in a pressure chamber while the xylem water was under positive pressure.
- Colbert, J. J. 1992. **Gypsy moth life system model: the stand-damage model**. In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings, North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 161. Abstract.
- Colbert, J. J. 1992. **Effects of the gypsy moth life system on growth and yield of mixed hardwood stands**. In: Teller, A.; Mathy, P.; Jeffers, J. N. R., eds. Responses of forest ecosystems to environmental changes; 1991 May 20-24; Florence, Italy. New York: Elsevier Applied Science: 961-962.
- Conners, Richard W.; Araman, Philip A.; Brisbin, Robert [Robert] L. 1992. **Reflections on the development of a machine vision technology for the forest products industry**. In: Yeh, M. C.; Wang, H. H.; Chiang, C. L., eds. Proceedings, knowledge-based expert system for the furniture industry. [Place of publication unknown]: [Publisher name unknown]: 6-1 - 6-20. Describes some of the benefits of machine vision technology and how this technology will evolve over the next 3 to 5 years, and addresses issues that must be considered when incorporating such technology in a plant. The hardwood forest products industry is emphasized since automatic defect detection and identification is more difficult in hardwoods than in softwoods.
- Conners, Richard W.; Cho, Tai-Hoon; Ng, Chong T.; Drayer, Thomas H.; Araman, Philip A.; Brisbin, Robert L. 1992. **A machine vision system for automatically grading hardwood lumber**. Industrial Metrology. 2(374): 317-342.
- Corbett, Edward S. 1992. **Gypsy moth defoliation impacts on water quality and quantity**. In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 31. Abstract.

- Cutler, Bruce; Jennings, Daniel T. 1992. **Habitat segregation by species of *Metaphidippus* (Araneae: Salticidae) in Minnesota.** *Journal of Arachnology*. 20: 88-93.
- Dawson, Chad P.; Zipperer, Wayne C. 1992. **Impacts of land use changes on recreation and open space in the New York-New Jersey Highlands Region.** In: *Proceedings of the symposium on social aspects and recreation research*; 1992 February 19-22; Ontario, CA. PSW-GTR-132. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station: 67-68.
- The more than 1-million-acre New York-New Jersey Highlands Region is a unique forested and rural landscape at the urban/wildland interface with the New York-New Jersey metropolitan area where more than 18 million people reside. Conversion of land to residential and urban uses, parceling of lands, fragmentation of forest cover, and increasing demand for recreational activities threaten to alter both open and forest-wildland landscapes. Projections of changes to the year 2010 suggest that comprehensive planning strategies are needed.
- deCalesta, David S. 1992. **Impact of deer density on species diversity of Allegheny hardwood stands.** In: Bellinger, R. R., ed. *Proceedings, 46th annual meeting of the Northeastern Weed Science Society*; 1992 January 6-9; Boston, MA. Ithaca, NY: Northeastern Weed Science Society: 135. Abstract.
- Decker, Thomas A.; Healy, William M.; Williams, Steven A. 1992. **Survival of white-tailed deer fawns in western Massachusetts.** *Northeast Wildlife*. 49(1): 28-35.
- DeGraaf, Richard M.; Yamasaki, Mariko; Leak, William B.; Lanier, John W. 1992. **New England wildlife: management of forested habitats.** Gen. Tech. Rep. NE-144. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 271 p.
- Presents silvicultural treatments for six major cover-type groups in New England to produce stand conditions that provide habitat for a wide range of wildlife species. Includes matrices for species occurrence and utilization by forested and nonforested habitat, habitat breadth and size class, and structural habitat feature for 338 wildlife species in New England.
- DeGraaf, Richard M. 1992. **Effects of even-aged management on forest birds northern hardwood stand interfaces.** *Forest Ecology and Management*. 47(1-4): 95-110.
- Brooding birds were counted along transects across edges of even-aged northern hardwood stands in the White Mountain National Forest in New Hampshire. Two replicate transects across each of seven edge types representing three classes of contrast (abrupt, intermediate, and subtle) were sampled during June 1983-85 to define species assemblages at stand edges and estimate the width and longevity of functional edges under even-age management.
- Of 52 bird species, 28 occurred across all three classes of edges, but no unique species or assemblages were evident at the edges between stands. Across edges between young stands, bird species richness declined linearly from seedling stand interior to pole stand interior, but there were no differences in cumulative bird species richness by edge contrast type.
- DeGraaf, Richard M.; Yamasaki, Mariko. 1992. **A nondestructive technique to monitor the relative abundance of terrestrial salamanders.** *Wildlife Society Bulletin*. 30(3): 260-264.
- Evaluates the use of boards (that may simulate logs) to monitor eastern redback salamanders in even-age managed stands of New England northern hardwood forests.
- Dempsey, Gilbert P.; Luppold, William G. 1992. **The state of hardwood lumber markets.** *Northern Logger*. 40(9): 22-24.
- The export market and most domestic markets for hardwood lumber products grew strongly between 1977 and 1989, and appeared to hold fairly steady during 1990. However, 1991 appears to have been a slack market for hardwood lumber sold domestically, while the export market has grown in both volume and value. The prospect for a strengthening domestic market relies primarily on a general economic recovery in the United States and a continued steadiness in the export market.
- Dennis, Donald F. 1992. **Parcelization and affluence: implications for nonindustrial private forests.** *Northern Journal of Applied Forestry*. 9(1): 33-35.
- Synthesizes the results of several empirical studies on landowner behavior. Attention is given to the effects of parcelization and increased affluence on timber harvesting, posting to limit access, recreational use, advice by professional foresters, and participation in voluntary property tax relief programs for forest land.
- Dennis, Donald F. 1992. **The effect of trends in forest and ownership characteristics on recreational use of private forests.** In: Vander Stoep, Gail A., ed. *Proceedings of the 1991 northeastern recreation research symposium*; 1991 April 7-9; Saratoga Springs, NY. Gen. Tech. Rep. NE-160. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 116-117.
- Probit analysis was used to estimate correlations between recreational use of private woodland and characteristics of the forest, owner, and surrounding community. Land held by more highly educated owners or those reared in large cities was more likely to be used for recreation; the opposite was true for land held by older owners.
- Dennis, Donald F.; Sendak, Paul E. 1992. **Analyzing the effectiveness of Vermont's modified assessment program for forest land.** In: Schmithusen, Franz, ed. *Forestry legislation: report of IUFRO Subject Group S6.13-00*. Zurich, Switzerland: Department Wald und Holzforschung: 55-61.
- Probit analysis is used to analyze the relationship between the probability of enrollment in Vermont's alternate property

tax program and characteristics of the parcel, owner, and surrounding community. Insight is provided that will aid in identifying beneficiaries, predicting future enrollment, and assessing whether the program is meeting stated goals.

Dennis, Donald F.; Sendak, Paul E. 1992. **An empirical study of enrollment in Vermont's Use Value Appraisal property tax program.** Canadian Journal of Forest Research. 22(9): 1209-1214.

A probit model was used to analyze the relationship between the probability of enrollment in Vermont's Use Value Appraisal property tax program for forest land and characteristics of the parcel, owner, and surrounding community. The results suggest that continued fragmentation of the forest and population growth will have a negative effect on enrollment, but these effects may be mitigated by increases in the education level of landowners and by increases in assessed values and property tax rates.

Domir, Subhash C.; Schreiber, Lawrence R.; Ichida, Jann M.; Eshita, Steve M. 1992. **Effect of elm selection, explant source and medium composition on growth of *Ophiostoma ulmi* on callus cultures.** Journal of Environmental Horticulture. 10(1): 59-62.

Effects of elm selection, explant source, and media composition on growth of the Dutch elm disease (DED) fungus *Ophiostoma ulmi* on callus cultures were examined. Calluses were generated from leaf and stem tissue of an American elm seedling (A), susceptible to the disease; an American elm selection 8630, resistant to the disease; and a Siberian elm seedling, also resistant to DED. Calluses were generated on modified Murashige-Skoog (MMS) medium, either with (MMSC) or without coconut milk. Explant source did not affect the fungal growth rate on the callus. Rate of *O. ulmi* growth on American elm A callus was similar on both media; on Siberian and 8630, fungal growth rate was more rapid on callus cultured on MMS than on MMSC. In the absence of callus tissue, *O. ulmi* growth on MMSC medium was more than 5 times as rapid as it was on MMS.

Doud, Lynn F.; Johnson, Walter W.; Blankenhorn, Paul R.; Stover, Lee R.; Luppold, William G. 1992. **A description of the 1987 kitchen cabinet industry in Pennsylvania.** Forest Products Journal. 42(4): 33-39.

The objective of this study was to analyze the Pennsylvania kitchen cabinet industry in 1987 by determining the size and distribution of the industry, types and quantities of materials used by the industry, and differences among various sizes of firms.

Dubois, Normand R. 1992. **Laboratory and field studies on *Bacillus thuringiensis* against the gypsy moth.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 34. Abstract.

Dubois, Normand R. 1992. **Recombinant DNA technology in *Bacillus thuringiensis*.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of

Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 15-16. Abstract.

Dubois, Normand R.; McLane, Winfred. 1992. **Comparative efficacy of *Bacillus thuringiensis*, Foray 48B, applied by mist blower or hydraulic sprayer on small blocks infested with gypsy moth.** In: Proceedings of the national gypsy moth review; 1991 November 4-7; Raleigh, NC. Raleigh, NC: National Gypsy Moth Management Board: 125-128.

Evaluates the efficacy of Bt, Foray 48B, against small 1-acre block infestations of gypsy moth (2nd-instar larvae) when applied at two doses, 12 BIU and 24 BIU per acre, by two types of ground applicators, mist blower and hydraulic sprayer, and at a minimum volume and the volume normally used with these applicators. For the mist-blower applications, volume rates were 10 and 30 gallons per acre; for the hydraulic sprayer, volume rates were 50 and 100 gallons per acre (water was the diluent). Each treatment was repeated 4 times; treatment effects were measured by egg-mass reduction, larval densities under burlap, and degree of foliage protection.

Dubois, N. R.; Dean, D. H. 1992. **Synergism between the insecticidal crystal proteins (ICP) of *Bacillus thuringiensis* encoded by the cryIA genes and *Bacillus* Species Spores and non-spore forming bacteria against the gypsy moth, *Lymantria dispar* L.** In: Programs & abstracts of the 25th annual meeting of the Society for Invertebrate Pathology; 1992 August 16-21; Heidelberg, Germany. [Place of publication unknown]: [Publisher name unknown]. Abstract.

Dunson, William A.; Wyman, Richard L.; Corbett, Edward S. 1992. **A symposium on amphibian declines and habitat acidification.** Journal of Herpetology. 26(4): 349-352.

Dwyer, John F.; McPherson, E. Gregory; Schroeder, Herbert W.; Rowntree, Rowan A. 1992. **Assessing the benefits and costs of the urban forest.** Journal of Arboriculture. 18(5): 227-234.

Eagar, Christopher; Miller-Weeks, Margaret; Gillespie, Andrew J. R.; Burkman, William. 1992. **Summary report: forest health monitoring in the Northeast, 1991.** NE/NA-INF-115-92. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 13 p.

The objectives of the 1991 forest health monitoring field season in the Northeast were to: (1) expand the permanent plot network to include three Mid-Atlantic States; (2) correct problems encountered in the 1990 field season; and (3) collect second-year observations on crown-rating data for the six New England States. All of these objectives were met satisfactorily.

Echelberger, Herbert E. 1992. **Forest recreation research: real answers to real questions.** Vermont Forest Quarterly. 10(4): 21-22.

Echelberger, Herbert E.; Bennink, John P.; Moulton, George W. 1992. **Tourism research and protection of the Connecticut River Valley**. New England Journal of Travel and Tourism. 3: 3-8.

A survey of Connecticut River riparian landowners was conducted to ascertain their uses, opinions and concerns for the River. Results helped get the River accepted for special protection designation. The data are useful to planners and developers interested in developing a more significant role for the tourism sector of that regions's economy.

Echelberger, Herbert E.; More, Thomas A. 1992. **Resident perceptions of Vermont State Parks**. In: Vander Stoep, Gail A., ed. Proceedings of the 1991 northeastern recreation research symposium; 1991 April 7-9; Saratoga Springs, NY. Gen. Tech. Rep. NE-160. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 94-97.

Reports results of a survey to determine Vermont residents' opinions about their state park system. More than 400 responses were obtained from current park users and nearly 300 were from non-users. Both day and overnight state park users were satisfied with the quality of service and facilities at the Vermont park they had most recently visited. Non-users also had positive feelings about the system as a whole. User fees were not considered deterrents for non-use of the parks.

Erickson, Michael D.; Hassler, Curt C.; LeDoux, Chris B. 1992. **Economic comparisons of haul road construction versus forwarding versus longer skid distances**. ASAE Pap. 92-7513. St. Joseph, MI: American Society of Agricultural Engineers. 19 p.

Ernst, Richard L. 1992. **SILVAH a stand prescription tool**. Compiler. 10(2): 43-45.

The primary purpose of the SILVAH system is to allow practicing foresters to easily prescribe silvicultural treatments. The process involves inventory, analysis, and prescription. During the inventory phase, information is collected about the existing stand overstory and understory conditions. These data are then analyzed to create tabular and narrative descriptions of the stand. Finally, the existing conditions in the stand, along with the management objectives, are used to decide a prescription or treatment strategy.

Frank, Robert M. 1992. **Tree and wildlife diversity response to silvicultural practices in northern conifers**. In: Simpson, C. M., comp. Proceedings of the seminar and integrated resource management; 1992 April 7-8; Fredericton, NB. Fredericton, NB: Forestry Canada, Maritimes Region: 57-75.

Gale, Peg; Yaussy, Daniel. 1992. **The woodman's Ideal growth projection system TWIGS**. Compiler. 10(2): 38-42.

The initial goal of The Woodman's Ideal Growth Projection System (TWIGS), an interactive simulation program was to provide a PC-based model that projected growth and yield for individual stands. TWIGS has since been refined and updated to include not only projections of growth and yield

but also economic analyses of changes in growth and yield due to management choices. TWIGS is a regional model with four versions now available: the Central States region (Missouri, Illinois, and Indiana), the Lake States region (Michigan, Minnesota, and Wisconsin), the Northeastern region (Ohio, Pennsylvania, Kentucky, West Virginia, New York, New Hampshire, Vermont, Massachusetts, Connecticut, Maine, and New Jersey), and Georgia. The TWIGS program projects growth and yield information for more than 35 species using species-specific diameter growth and mortality equations.

Galford, Jimmy R.; Auchmoody, L. R.; Walters, Russell S.; Smith, H. Clay. 1992. **Millipede damage to germinating acorns of northern red oak**. Res. Pap. NE-667. Radnor, PA. U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

Millipedes have not been reported as pests of germinating acorns. Studies in Pennsylvania on the impact of insects on northern red (*Quercus rubra* L.) seeding establishment revealed that the millipede *Ptyoiulus impressus* (Say) damaged the radicles of germinating acorns. Up to 17 percent of the acorn radicles in areas with heavy acorn crops were damaged in 1991. Millipede feeding began in late March to early April, several days prior to feeding activity of insects that damage or destroy germinating acorns.

Gansner, David A.; Birch, Thomas W.; Sheffield, Raymond M.; McWilliams, William H. 1992. **Central Appalachian hardwoods: getting bigger and stocking up**. Allegheny News. April: 17-19.

Gansner, David A.; Widmann, Richard H.; Amer, Stanford L.; Alerich, Carol L.; Quimby, John W. 1992. **Pennsylvania oak suffers from gypsy moth assaults**. Northern Logger. 41(1): 20-21.

Garrett, Peter W. 1992. **Performance of Himalayan blue pine in the northeastern United States**. Tree Planters' Notes. 43(3): 76-80.

Gatchell, Charles J. 1992. **Gang-rip-first to increase the value of low-grade hardwoods**. In: Rose, Mary Annette, ed. Alternatives for the 90's: wood products, technologies and international markets; conference proceedings; 1991 November 1-2; Cambridge, OH. Morgantown, WV: Appalachian Export Center for Hardwoods and Southern Ohio Wood Industry Consortium: 74-77.

The USDA Forest Service is exploring the economic feasibility of using lower grade hardwoods to produce furniture and cabinet parts with gang-rip-first procedures. No. 1 and 2 Common lumber are compared according to total yield and length-width groupings.

Gatchell, Charles J. 1992. **Increasing yields from lower grade lumber**. Woodshop News. 6(12): 24-25.

Gatchell, Charles; Klinkhachorn, Powsiri; Kothari, Ravi. 1992. **ReGS--a realistic grading system**. Forest Products Journal. 49(10): 37-40.

ReGS (Realistic Grading System) is an extension of the basic algorithm used to develop the HaLT, HaLT2, and

HaRem lumber grading and remanufacturing training programs. ReGS was developed to meet the needs of those wishing to grade boards with shapes other than a perfect rectangle. ReGS also can be used to grade boards with any number of defects because the time required to achieve a solution is not an important factor.

Gatchell, Charles J.; Wiedenbeck, Janice K.; Walker, Elizabeth S. 1992. **1992 data bank for red oak lumber**. Res. Pap. NE-669. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 47 p.

Developed for researchers and industrial decisionmakers who may have only a limited knowledge of National Hardwood Lumber Association grades, the data bank for red oak lumber contains a limited description of factors affecting the grades. Included are a description of ReGS, the computer program for grading lumber; reasons why users who buy kiln-dried lumber may want to specify the Special Kiln-Dried Rule; the effect of kiln drying on soundness of knot; and the surprising finding that relatively few No. 1 Common and No. 2A Common boards contain pith.

Gilbert, A.; Glass, R.; More, T. 1992. **Valuation of eastern wilderness: extramarket measures of public support**. In: Payne, Claire; Bowker, J. M.; Reed, Patrick C., comps. The economic value of wilderness: Proceedings of the conference; 1991 May 8-11; Jackson, WY. Gen. Tech. Rep. SE-78. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 57-70.

Dichotomous choice and open-ended contingent valuation procedures were used to estimate the general public's maximum willingness to pay for the protection and management of Eastern Wilderness and Lye Brook Wilderness Area in southwest Vermont. Respondents were asked to allocate their maximum willingness to pay between use and preservation values. Logit and Tobit regression models were used to estimate median and mean annual economic values for Lye Brook and Eastern Wilderness.

Gillespie, A. J. R. 1992. **Tropical forest inventories: status and trends**. In: American forestry--an evolving tradition. Proceedings of the 1992 Society of American Foresters national convention; 1992 October 25-28; Richmond, VA. SAF Publ. 92-01. Bethesda, MD: Society of American Foresters; 67-71.

The major differences between forest inventory conducted on tropical lands and inventories conducted in temperate forests relate to diversity, infrastructure, and logistics. Despite such differences, many of the trends presently affecting temperate forest inventory are also affecting tropical forest inventory. These include an increase in species and products of interest; a shift from exploitation to conservation orientation; a change from inventory being export driven to locally driven; and a shift in perspective from local to regional or global concern.

Glass, Ronald J.; More, Thomas A. 1992. **Equity preferences in the allocation of goose hunting opportunities**. Journal of Environmental Management. 35(4): 271-279

Goose hunting opportunities in the Northeast are increasingly limited, and demand often exceeds the supply of hunting opportunities. Where this is the case, existing opportunities must be allocated in some way--usually either market pricing, "first-come, first-served" or by lottery. Each of these methods raises questions about equity or fairness. During the 1987 goose season, hunters at Dead Creek Wildlife Management Area in Addison, Vermont, were given a mail-back questionnaire to determine their sentiments about the fairness of the existing process, alternative allocation systems, the monetary value of the opportunity and other questions related to the hunt.

Glass, Ronald J.; More, Thomas A. 1992. **Satisfaction, valuation, and views toward allocation of Vermont goose hunting opportunities**. Res. Pap. NE-668. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5 p.

A survey of goose hunters on a limited access area, Dead Creek Goose Management Area in Vermont, was conducted during the fall of 1987. Respondents appeared well adapted to the structural hunting environment and agreed with most of the special rules and regulations. The current lottery system was favored over a "first-come, first-served" system.

Glass, Ronald J.; More, Thomas A.; DiStefano, James J. 1992. **Vermont trappers: Characteristics, motivations, and attitudes**. Transactions of the Northeast Section of the Wildlife Society. 48: 134-143.

Discusses the objectives of Vermont trappers, their perceptions and attitudes toward wildlife and society, their socioeconomic characteristics, and their viability in the face of increasing pressures on the environment and trapping activities.

Glass, Ronald J.; More, Thomas A.; Siemer, William F.; Brown, Tommy L.; Batcheller, Gordon R.; DiStefano, James J. 1992. **Trappers in New York and Vermont: Comparisons of social characteristics and motivations**. In: Vander Stoep, Gail A., ed. Proceedings of the 1991 northeastern recreation research symposium; 1991 April 7-9; Saratoga Springs, NY. Gen. Tech. Rep. NE-160. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 134-138.

Trapping has a long history in North America, yet it is the focus of heated debate. Is it a sport, a business, or a subsistence activity? Unfortunately, we know little about trappers, their attitudes, motivations, and personal characteristics. The results of two trapper surveys, one in New York and one in Vermont, reveal great similarities between trappers of both states. Muskrat and mink were the most common target species and most trappers in both states used foothold traps. The majority had an educational level of high school or less, and a median family income of \$20,000 to \$30,000.

Glass, Ronald J.; Muth, Robert M. 1992. **Commodity benefits from wilderness: salmon in southeast Alaska**. In: Payne, Claire; Bowker, J. M.; Reed, Patrick C., comps. The economic value of wilderness:

- proceedings of the conference; 1991 May 8-11; Jackson, WY. Gen. Tech. Rep. SE-78; Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 141-153.
- Glass, Ronald J.; Walton, Gerald; Echelberger, Herbert E. 1991. **Estimates of recreation use in the White River Drainage, Vermont.** Res. Pap. NE-658. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 10 p.
- An observation technique that incorporates modified, stratified sampling was used to estimate in-stream recreation use in the White River Drainage in Vermont. Results are reported by season, day of week, time of day, type of activity, and portion of stream.
- Gottschalk, Kurt W. 1992. **Gypsy moth effects.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. **Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD.** Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 21. Abstract.
- Gottschalk, Kurt W. 1992. **Herbivory and harvesting effects on development of interfering vegetation in *Quercus* stands.** In: Gjerstad, Dean H.; Glover, Glenn R., eds. **Program and abstracts from the international conference on forest vegetation management: ecology, practice and policy; 1992 April 27-May 1; Auburn, AL.** Sch. For. Rep. 1992:1. Auburn, AL: Auburn University: 86. Abstract.
- Gottschalk, Kurt W. 1992. **Is silviculture the answer to northeastern forest insect and disease problems?** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. **Proceedings, North American forest insect work conference; 1991 March 25-28; Denver, CO.** Gen. Tech. Rep. PNW-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station: 106. Abstract.
- Gottschalk, Kurt W.; Feicht, David L.; Fosbroke, Sandra L. C. 1992. **Evaluation of silvicultural treatments to minimize gypsy moth impacts.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. **Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD.** Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 20. Abstract.
- Gottschalk, Kurt W.; Twery, Mark J., eds. 1992. **Proceedings, U.S. Department of Agriculture Interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD.** Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 54 p.
- Includes 8 workshop summaries and 27 abstracts of oral and poster presentations on gypsy moth biology, molecular biology, ecology, impacts, and management.
- Gottschalk, Kurt W.; Twery, Mark J., eds. 1992. **Proceedings, U.S. Department of Agriculture Interagency gypsy moth research forum 1992: 1992 January 13-16; Annapolis, MD.** Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 60 p.
- Includes workshop summary and 45 abstracts of oral and poster presentations on gypsy moth biology, molecular biology, ecology, impacts, and management.
- Gove, Jeffrey. 1992. **Inventory and diversity programs from the NEFES.** Compiler. 10(2): 21.
- Gove, Jeffrey H.; Fairweather, Stephen E. 1992. **Optimizing the management of uneven-aged forest stands: a stochastic approach.** *Forest Science*. 38(3): 623-640.
- Mathematical programs used for management and policy decisions in natural resources usually contain at least one underlying component which is stochastic. A technique is presented that allows marginal, conditional, and empirical confidence regions to be calculated for a widely known model of optimal uneven-aged stand structure. The nonparametric bootstrap is used to approximate the joint sampling distribution for decision variables of the nonlinear programming model. Multivariate normal theory is used to obtain 95-percent confidence statements on decision variables and functions thereof. Results show that the optimal steady-state investment-efficient diameter distribution for uneven-aged northern hardwood stands in an imprecise estimate given the data used for growth model calibration and the assumptions of the mathematical model.
- Gove, J. H.; Solomon, D. S. 1992. **Maximizing and maintaining structural diversity within forest stands using mathematical programming models.** In: Wood, Geoff; Turner, Brian, eds. **Integrating forest information over space and time: proceedings, IUFRO conference; 1992 January 13-17; Canberra, Australia.** Canberra, Australia: ANUTECH Pty Ltd: 445-453.
- Reviews two methods for incorporating measures of ecological diversity into mathematical programming models that provide a way to view diversity as the objective function (that is, the quantity to be maximized) or, alternatively, to model diversity as a constraint while achieving another objective. In this latter case, it is appropriate to maximize quantities such as volume per unit area or the land expectation value while ensuring that structural diversity is at least as great as that found in a "diversity-standard" community.
- Gove, Jeffrey H.; Martin, C. Wayne; Patil, Ganapati P.; Solomon, Dale S.; Hornbeck, James W. 1992. **Plant species diversity on even-aged harvests at the Hubbard Brook Experimental Forest: 10-year results.** *Canadian Journal of Forest Research*. 22(11): 1800-1806.
- Comparisons of plant-species diversity were made on two separate watersheds treated by a block clearcut and progressive strip cut in the Hubbard Brook Experimental Forest in New Hampshire. Intrinsic diversity profiles were used to make diversity comparisons; a jackknifing

technique was used on the diversity profiles for bias correction and to test for intrinsic diversity orderings. Comparisons were made within treatments over time and between treatments at 1 and 10 years after cutting. Plant-species diversity was lowest the year following treatment on both watersheds, and was at its highest 10 years after cutting on the progressive strip cut; however, diversity decreased on the block clearcut after 10 years.

Graber, Raymond E.; Leak, William B. 1992. **Seed fall in an old-growth northern hardwood forest.** Res. Pap. NE-663. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.

Seed fall was measured for 11 years in a 200-year-old stand of sugar maple, yellow birch, and beech in New Hampshire. Yellow birch had five good seed years, sugar maple had three, and beech had none. Viable seed fall of yellow birch began in August and continued through autumn and winter. Most of the viable sugar maple seed fell during a short period in October. Beech seed fall occurred slightly later than sugar maple.

Halverson, Howard G.; Sidle, Roy C. 1992. **Cumulative effects of mining on hydrology, water quality, and vegetation.** In: Chambers, Jeanne C.; Wade, Gary L., eds. Evaluating reclamation success: the ecological consideration—proceedings of a symposium; 1990 April 23-26; Charleston, WV. Gen. Tech. Rep. NE-164. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 99-104.

Evaluating the cumulative effects of mining and other land disturbances at the watershed scale poses a challenge for researchers and practitioners. Offsite cumulative effects may arise due to multiple mining disturbances occurring simultaneously within a watershed, or from the interaction of mining activities and adjacent land uses (grazing, residential development, recreation, timber harvest). Progressive surface and underground mining may generate onsite cumulative effects by modifying soil and vegetation composition, slope stability, and surface erosion potential. This temporal sequence, typical of many coal mining operations in the East and gold mining operations in the West, can affect offsite resources such as water chemistry, channel sedimentation, riparian vegetation, aquatic habitat, and peak flows.

Hansen, Bruce G. 1992. **A decade of European tropical and temperate hardwood product imports: 1981 to present.** In: FPRS 46th annual meeting: biographies & abstracts; 1992 June 21-24; Charleston, SC. Madison, WI: Forest Products Research Society: 16. Abstract.

Hansen, Bruce G.; Luppold, William G. 1992. **Japanese demand for hardwood lumber.** In: FPRS 46th annual meeting: biographies & abstracts; 1992 June 21-24; Charleston, SC. Madison, WI: Forest Products Research Society: 48. Abstract.

Hansen, Bruce; Luppold, William. 1992. **Factors affecting Japanese hardwood lumber imports, 1976 to 1990.** Forest Products Journal. 42(9): 47-51.

Over the past 15 years, U.S. hardwood lumber exports to Japan have grown from a relatively small volume to more than 135 million board feet in 1989. During this period, the U.S. share of all Japanese lumber imports rose from about 3 or 4 percent in the mid-to-late 1970s to nearly 20 percent in 1990. Factors that have influenced the growth of Japanese imports of U.S. hardwood lumber are examined. These include: 1) exchange rates; 2) prices of U.S. temperate, non-U.S. temperate, and tropical hardwood imports; and 3) economic growth in Japan.

Hansen, Bruce G.; Luppold, William G.; Smith, W. Ramsey. 1992. **Overview of U.S. hardwood exports to Japan with emphasis on exchange rate influences in hardwood lumber imports.** Wood Report. 6(13): 15-17. In Japanese.

Examines the U.S. position in the Japanese lumber market along with factors that have led to an increase in Japanese imports of U.S. hardwood lumber.

Harris, M. M.; Safford, L. O. 1992. **A rapid technique for drying organic soil horizons using a microwave oven.** Soil Science. 154(5): 420-425.

A procedure was developed for rapidly drying organic soil horizons in a microwave oven. Dry weights consistent with values obtained by conventional drying methods were obtained by drying these materials for 20 to 30 minutes at medium (490 W) power.

Healy, William M. 1992. **Behavior.** In: Dickson, James G., ed. The wild turkey—biology and management. Chapter 5. Harrisburg, PA: Stackpole Books.

Healy, William M. 1992. **Population influences: environment.** In: Dickson, James G., ed. The wild turkey—biology and management. Chapter 10. Harrisburg, PA: Stackpole Books.

Healy, William M.; Welsh, Christopher J. E. 1992. **Evaluating line transects to monitor gray squirrel populations.** Wildlife Society Bulletin. 20: 83-90.

Evaluates the feasibility of using line-transect surveys to monitor populations of gray squirrel. Presents results of 6 years of line-transect sampling of an un hunted gray squirrel population in western Massachusetts and offers recommendations for using this technique.

Hillebrand, James J.; Ernst, Richard L.; Stout, Susan L.; Fairweather, Stephen E. 1992. **Using relative diameter to improve density measures in Allegheny hardwood stands.** Forest Ecology and Management. 55: 225-232. Relative measurements of density in even-aged stands of mixed hardwoods have proven more useful for assessing crowding than absolute measures. Species composition and average tree size often result in large differences in absolute measures of density such as numbers of trees per acre or basal area per acre. The measure currently used for Allegheny hardwood stands assesses relative density by summing the growing space of all trees as a function of their species and diameter. The relative density calculated by this measure is well correlated with net basal-area growth in unthinned stands and stands that have been silviculturally

thinned, predominantly from below. But in stands that have been thinned to alter stand structure, the correlation with net basal-area growth is poor.

Hiremath, Shivanand T. 1992. **Molecular biology**. In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 15-16. Abstract.

Hiremath, Shivanand. 1992. **Purification, characterization and regulation by juvenile hormone of vitellogenin in the gypsy moth**. In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 37-38. Abstract.

Hiremath, Shivanand; Jones, Davy. 1992. **Juvenile hormone regulation of vitellogenin in the gypsy moth, *Lymantria dispar*: suppression of vitellogenin mRNA in the fat body**. *Journal of Insect Physiology*. 38(6): 461-474.

Hormonal regulation of vitellogenin synthesis and accumulation in the gypsy moth was examined using a potent juvenile hormone analogue fenoxycarb. Vitellogenin in the haemolymph of female larvae was detected on days 4-5 of the 5th (final) larval stadium and continued to accumulate throughout the remainder of the stadium. Treatment of larvae with fenoxycarb during the intermolt period from 4th to 5th instar caused a delay in the appearance of vitellogenin in the haemolymph, and the rate of vitellogenin accumulation decreased. This effect of fenoxycarb was dose responsive and depended on the developmental stage of the larva. Treatment after day 2 of the 5th stadium had no effect on vitellogenin accumulation.

Hiremath, Shivanand T.; Slavicek, James J. 1992. **Recombinant LdNPV expressing bacterial beta-galactosidase**. In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 38-39. Abstract.

Hoff, Kristen G. 1992. **Computer integrated production planning tool for secondary wood processing industry**. In: Technologies for competitive growth in West Virginia; 1992 October 28; Shepherdstown, WV Morgantown, WV: Software Valley Foundation: 13-15.

A framework for decisionmaking was developed that allows wood-products manufacturers to consider cost tradeoffs based on the concept of computer-integrated production planning. The algorithm considers sequence-dependent setup costs, inventory carrying costs, and order due dates, as well as work force and machine capacities at each work

center. The algorithm generates a production schedule. Although developed for wood furniture manufacturers, this algorithm can be applied to other wood product firms.

Hoff, Kristen G.; Adams, Edward L.; Walker, Elizabeth S. 1992. **Computer optimization of hardwood parts yield using gang-rip-first procedures**. *Forest Products Journal*. 42(3): 57-59.

A microcomputer program, GR-1ST (gang-rip-first), is available for determining optimum gang-rip-first procedures in processing hardwood lumber. GR-1ST provides parts-yield information per board, plots of each board plus the resulting saw cuts and parts produced, and summary information for all parts produced during program execution.

Hoff, Kristen G.; Sarin, Subhash C.; Anderson, R. Bruce. 1992. **Graphic model of the processes involved in the production of casegood furniture**. Res. Pap. NE-666. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 39 p.

Hornbeck, J. W.; Leak, W. B. 1992. **Ecology and management of northern hardwood forests in New England**. Gen. Tech. Rep. NE-159. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 44 p.

Ecological, silvicultural, and hydrological knowledge of the northern hardwood forest type in New England is summarized for use by practicing foresters, landowners, managers, and planners.

Hornbeck, James W.; Swank, Wayne T. 1992. **Watershed ecosystem analysis as a basis for multiple-use management of eastern forests**. *Ecological Applications*. 2(3): 238-247.

There is ever-increasing competition for the many uses and natural resources of forests in Eastern United States. Multiple use management has long been a stated goal for these forests, but application has been problematic and seldom satisfactory to all users. There is a need to incorporate more science into management decisions for Eastern forests, and thereby convincingly demonstrate to forest managers and the public why certain combinations of uses may or may not be compatible. One proven approach for doing this is to use watershed ecosystem analysis. Small watersheds, usually less than 100 ha in area, serve as a convenient ecosystem boundary for studying how forests function in terms of cycling energy, nutrients, and water. Results of these studies allow assessments of forest health and productivity, and evaluations of impacts of both natural and human-related disturbances. This paper provides illustrations of how watershed ecosystem analysis can be used to study effects of current harvesting practices, atmospheric deposition, and past land use. The paper also discusses needs and methods for putting these results in a context that can be readily understood and used by forest managers and the public.

Horsley, Stephen B. 1992. **Historical and contemporary herbivory by deer in a temperate forest ecosystem: the Allegheny hardwood forest**. *Bulletin of the*

- Ecological Society of America. 73(2) (Suppl.): 212. Abstract.
- Horsley, Stephen B. 1992. **Species diversity of Allegheny hardwood stands over time after a single application of glyphosate.** In: Bellinder, R. R., ed. Proceedings, 46th annual meeting of the Northeastern Weed Science Society; 1992 January 6-9; Boston, MA. Ithaca, NY: Northeastern Weed Science Society: 137. Abstract.
- Horsley, Stephen B.; McCormick, Larry H.; Groninger, John W. 1992. **Effects of timing of Oust application on survival of hardwood seedlings.** Northern Journal of Applied Forestry. 9(1): 22-27.
- Oust herbicide (sulfometuron methyl) was applied with or without surfactant at the rate of 2 ounces per acre in early July, early August, early September, and early October to black cherry, red maple, and white ash seedlings of three sizes to evaluate their tolerance to Oust. Treatment plots were in northwestern and central Pennsylvania. Survival and damage of treated seedlings were compared with a no-herbicide control 1 year after treatment. Black cherry and white ash were sensitive to Oust; red maple showed little sensitivity. Greatest damage and mortality to black cherry occurred with early July applications; applications from early August onward resulted in greater black cherry seedling survival and less severe damage than July applications. White ash mortality was high with applications from early July through early September.
- Houston, David R. 1992. **A host--stress--saprogen model for forest dieback-decline diseases.** In: Manion, Paul D.; Lachance Denis, eds. Forest decline concepts. St. Paul, MN: American Phytopathological Society: 3-25.
- Describes a model for dieback-decline diseases. Partitioning the developmental stages of these diseases into separate phases that encompass one or more stages of stress and host response followed by debilitating and often mortality-causing attacks of saprogenic organisms provides a framework to aid in disease diagnosis and study. It also serves to emphasize the chronological ordering of the stress/host change/saprogen relationship.
- Houston, David R. 1992. **Effects of paraformaldehyde on sugar maples tapped for sap. I. survey of damage.** Phytopathology. 82(10): 116. Abstract.
- Jackson, William A.; Iskra, Alan; Edwards, Pamela J. 1992. **Characterization of ozone symptoms on native vegetation at the Solly Sods and Otter Creek Wildernesses.** In: Berglund, Ronald L., ed. Tropospheric ozone and the environment II; 1992 November 4-7; Atlanta. GA. Pittsburgh, PA: Air and Waste Management Association: 526-536.
- Surveys designed to evaluate plant injury caused by ozones were conducted between 1988 and 1991 at the Dolly Sods Wilderness and Otter Creek Wilderness located in north-central West Virginia. Plots were visited to record the number of plants within a species expressing ozone symptoms and the amount of foliage with stippling. Ozone symptoms were recorded on nine bioindicators; seven of the species had stippling on less than 50 percent of the foliage and an average severity rating of trace or light. Black cherry had stippling on 50 to 70 percent of the foliage and an average severity rating of moderate.
- Johnson, A. H.; McLaughlin, S. B.; Adams, M. B.; Cook, E. R.; DeHayes, D. H.; Eagar, C.; Fernandez, I. J.; Johnson, D. W.; Kohut, R. J.; Mohnen, V. A.; Nicholas, N. S.; Peart, D. R.; Schier, G. A.; White, P. S. 1992. **Synthesis and conclusions from epidemiological and mechanistic studies of red spruce decline.** In: Eagar, Christopher; Adams, Mary Beth, eds. Ecology and decline of red spruce in the Eastern United States. Ecol. Stud. 96. New York: Springer-Verlag: 385-411.
- Johnson, Robert W.; Tyree, Melvin T. 1992. **Effect of stem water content on sap flow from dormant maple and butternut stems.** Plant Physiology. 100: 853-858.
- Sap flow from excised maple stems collected over the winter (1986/87) was correlated with content of stem water. Stem-water content was high in the fall (> 0.80) and decreased rapidly during 2 weeks of continuous freezing temperatures in late winter (< 0.60). Exudation of sap from stem segments subjected to freeze/thaw cycles was small in the fall, but exudation was substantial (45 to 50 ml/kg) following the decline in water content. Exudation volume was increased by 200 to 300 percent in maple stems originally at high water content (> 0.80) after perfusion with sucrose and dehydration at -12°C.
- Keena, Melody A.; ODell, Thomas M.; Tanner, John A. 1992. **Abnormal performance syndrome in the gypsy moth: diet and parental effects.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 25. Abstract.
- Klinkhachorn, Powsiri; Gatchell, Charles; McMillin, Charles; Kothari, Ravi; Yost, Dennis. 1992. **HaLT2--an enhanced lumber grading trainer.** Forest Products Journal. 42(10): 32-36.
- The computer program HaLT2, an improved version of HaLT (Hardwood Lumber Training Program), provides training in lumber grading for both novice and experienced hardwood lumber graders in accordance with National Hardwood Lumber Association (NHLA) rules. HaLT2 can be used to create boards that emphasize particular points of study. It also can grade actual boards for evaluative use by industry, academia, and the NHLA.
- Kohl, M.; Scott, C. T. 1992. **Survey planning for national forest inventories.** In: Wood, Geoff; Turner, Brian, eds. Integrating forest information over space and time: IUFRO conference; 1992 January 13-17; Canberra, Australia. Canberra, Australia: ANUTECH Pty Ltd: 325-329.
- An approach to developing optimal sampling design alternatives is described and implemented in an interactive FORTRAN 77 program called SIZE. The program puts the survey designer in a position to easily generate a variety of

sampling design alternatives using combinations of sampling rules, number of occasions, and cost/precision levels. The sampling rules used are simple random sampling, stratified random sampling, and double sampling for stratification. For successive occasions, estimators using only remeasured plots (Continuous Forest Inventory) or estimators using updated, remeasured, and new plots (Sampling with Partial Replacement) can be used. The objective of the optimization can either be to minimize survey costs for fixed precision levels or to minimize variance for fixed cost. This provides the opportunity for survey administrators and survey planners to refine the survey objectives to form a realistic set of design alternatives. The final decision can be an informed one based on factors other than just cost-effectiveness. The result is an efficient design which meets the survey objectives.

Layton, Deborah A.; LeDoux, Chris B.; Hassler, Curt C. 1992. **Cost estimators for construction of forest roads in the central Appalachians.** Res. Pap. NE-665. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

Regressions equations were developed for estimating the total cost of road construction in the central Appalachian region. Estimators include methods for predicting total costs for roads constructed using hourly rental methods and roads built on a total-job bid basis. Results show that total-job bid roads cost up to 5 times as much as roads built than when equipment is rented hourly. The estimates presented are for well-drained, stone-surfaced, permanent, minimum- to high-standard roads.

Leak, William B. 1992. **Vegetative change as an index of forest environmental impact.** Journal of Forestry. 90(9): 32-35.

During the past few years, there have been numerous articles about environmental influences and stress of North American forests, primarily from atmospheric deposition, climatic trends and aberrations, and management practices. One type of damage that is of concern concerns changes in site capability due to environmental effects on climate and soil. Environmental influences that alter forest site conditions can best be detected by those methods and measures that have proven useful in site evaluation.

LeDoux, Chris B.; Huyler, Neil K. 1992. **Cycle-time equations for five small tractors operating in low-volume small-diameter hardwood stands.** Res. Pap. NE-664. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 6 p.

Prediction equations for estimating cycle time were developed for five small tractors studied under various silvicultural treatments and operating conditions. These included the Pasquali 933, a Holder A60F, a Forest Any Forwarder (Skogsman), a Massey-Ferguson, and a Same Minitarus. Skidding costs were estimated based on the cycle-time equations. Using these equations to determine the incremental effect of log size on cost shows that hooking a 30-ft³ log cost \$0.103/ft³ while hooking six logs to form a 30-cubic foot turn cost \$0.234/ft³, an increase of 127 percent.

Liebhold, Andrew M. 1992. **Are North American populations of gypsy moth (Lepidoptera: Lymantriidae) bimodal?** Environmental Entomology. 21(2): 221-229.

The evidence for and against numerical bimodality in gypsy moth populations is reviewed. Reexamination of Melrose Highlands data (egg-mass densities at 83 plots in New England from 1910-31) indicated bimodality in $f(N)$ when data were expressed as yearly means of several plots in a zone 30 km in diameter, but no clear evidence of bimodality in the dynamics at individual plots. Density fluctuations in these relatively small plots (0.07 ha) apparently were dominated by random effects. It is hypothesized that short-range dispersal dominates the dynamics of populations at these spatial scales.

Liebhold, Andrew. 1992. **Gypsy moth research and development program: technology update--new approaches to sampling for decision making.** Gypsy Moth News. 29: 10-13.

Because of the difficulty in obtaining adequate numbers of samples and because of the intrinsically variable relationship between measures of egg-mass density (and other stand-level measurements) to defoliation, we may never be able to predict defoliation with an adequate level of precision from stand-level data alone. The most attractive solution to this problem in the future may be to use both regional population data and stand-level data.

Liebhold, Andrew. 1992. **New approaches to sampling for decision making.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 26-27. Abstract.

Liebhold, Andrew M.; Halverson, Joel A.; Eimes, Gregory A. 1992. **Gypsy moth invasion in North America: a quantitative analysis.** Journal of Biogeography. 19: 413-420.

Since 1869, the range of the gypsy moth includes most of the Northeastern States and the eastern provinces of Canada. Historical records of gypsy moth invasion in North America were assembled in a geographical information system. Individual U.S. counties and Canadian census districts were used as the smallest spatial unit. The data indicated three distinct periods during which spread rates differed: a high rate (9.45 km/year) from 1900 to 1915, a low rate (2.82 km/year) from 1916 to 1965, and a very high rate (20.78 km/year) from 1966 to 1990. Expansion was slower (7.61 km/year) in 1966-90 in countries where the mean minimum temperature was less than 7°C.

Liebhold, Andrew M.; Hohn, Michael E.; Gribko, Linda S. 1992. **Geostatistical models for forecasting gypsy moth outbreaks.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest

- Service, Northeastern Forest Experiment Station: 27-28. Abstract.
- Liebholt, Andrew; Luzader, Eugene; Elmes, Gregory. 1992. **Gypsy moth spread in the past and future.** In: Proceedings of the national gypsy moth review; 1991 November 4-7; Raleigh, NC. Raleigh, NC: National Gypsy Moth Management Board: 74-79.
Examines historical data to evaluate the impact of the previous "barrier zone" management and discusses the feasibility of future containment activities.
- Liebholt, Andrew; Luzader, Eugene; Elmes, Gregory; Halverson, Joel. 1992. **Quantitative analysis of gypsy moth invasion of North America.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 28-29. Abstract.
- Liebholt, Andrew; Luzader, Eugene; Elmes, Gregory; Halverson, Joel; Quimby, John. 1992. **Landscape characterization of forest susceptibility to gypsy moth defoliation in Pennsylvania.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 29-30. Abstract.
- Liechty, Hal O.; Holmes, Michael J.; Reed, David D.; Mroz, Glenn D. 1992. **Changes in microclimate after stand conversion in two northern hardwood stands.** Forest Ecology and Management. 50: 253-264.
Changes in air temperature, soil temperature, and soil moisture were monitored for 5 years in two northern hardwood stands after whole-tree harvesting and conversion to red pine (*Pinus resinosa* Ait.) plantations. Soil temperatures at a depth of 5 cm and maximum air temperatures 2 m above the soil surface were increased 5 to 25 percent after stand conversion. Soil moisture content at a depth of 5 cm was increased by 10 to 20 percent in one stand but not in the other. Differences in stand, soil, and topographical characteristics between the two stands did not have any apparent effect on the magnitude of air or soil temperature changes after stand conversion. However, higher initial stand density and soil water holding capacity appeared to be related to increased soil moisture content at one of the sites. The increased soil temperatures after conversion were not only a result of the removal of the northern hardwood canopy but also the removal and redistribution of the forest floor caused by whole-tree harvesting. Five years after stand conversion air temperature, soil temperature, and soil moisture showed no evidence of recovering from initial post-harvest levels.
- Lindsay, John J.; Gilbert, Alphonse H.; Birch, Thomas W. 1992. **Factors affecting the availability of wood energy from nonindustrial private forest lands in the Northeast.** Resour. Bull. NE-122. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 19 p.
Describes factors affecting the availability of fuelwood from nonindustrial private forests (NIPF) in the Northeast. The availability of market fuelwood depends heavily on tract size. The demand for land to supply the expanding urban fringe may result in a lower supply of market wood but also in more wood being cut to satisfy the owner's need for wood. NIPF owners in the Northeast might be persuaded to sell firewood to a regional market, but this supply would not meet the region's total energy needs for more than several years. However, fuelwood could become an important energy supplement in the Northeast until alternative energy sources are developed.
- Long, Robert P. 1992. **Maintaining sugarbush health—the Ohio experience.** In: Heiligmann, Randall B., ed. Proceedings, 1992 joint meeting of North American Maple Syrup Council; 1992 October 22-24; Concord, OH. Columbus, OH: Ohio State University Extension Service: 9-16.
- Luppold, W. G. 1992. **Data considerations when analyzing changes in international demands for forest products.** In: IUFRO proceedings: all-division 5 conference "forest products"; 1992 August 23-28; Nancy, France. [Place of publication unknown]: [Publisher name unknown]: 812. Abstract.
- Luppold, William G. 1992. **Factors influencing price and availability of hardwood pallet material.** Pallet Enterprise. 12(6): 2-3.
- Luppold, William G. 1992. **The Canadian connection in the North American hardwood lumber export market.** Northern Journal of Applied Forestry. 9(3): 91-93.
Provides an alternative look at exports of lumber from the United States to Canada and examines the connection between Canada and U.S. exports to Europe.
- Luppold, William. 1992. **The hardwood log export situation.** In: Welker, John C., comp. Proceedings of the 1992 southern forest economics workshop on the economics of southern forest productivity: competing in world markets; 1992 April 29-May 1; Mobile, AL. [Place of publication unknown]: [Publisher name unknown]: 43-53.
The export of hardwood logs to European and Asian countries is a topic of considerable controversy. The recent history of hardwood log exports with respect to species, products, and markets is examined.
- Luppold, William; Hansen, Bruce. 1992. **An overview of Japanese market for U.S. Hardwoods.** Import/Export Wood Purchasing News. April/May. Examines the U.S. position in the Japanese market along with factors that have led to the increase in Japanese imports of U.S. hardwood lumber.
- Luppold, William G.; West, Cynthia D. 1992. **Factors influencing price and availability of hardwood pallet material.** Pallet Enterprise. September/October. 2 p.

Lutz, Jack; Howard, Theodore E.; Sendak, Paul E. 1992. **Stumpage price reporting in the Northern United States.** Northern Journal of Applied Forestry. 9(2): 69-73.

Data collection, processing, and dissemination methods of stumpage price reports in the Northern United States vary considerably among states due to different objectives, markets, traditions, and budget constraints. Data are collected primarily from limited segments of the market with little quality control exerted by the compiling agencies. Prices are reported in terms of species, timber quality, and major product, and range from detailed lists to gross aggregates. Important areas for improving the price reports include more rapid dissemination, broader sampling of transactions, improved quality control and statistical analysis, and increased computerization.

Lynch, Ann M.; Twery, Mark J. 1992. **Forest visual resources and pest management: potential applications of visualization technology.** Landscape and Urban Planning. 21: 319-321.

Visualization technology allows us to picture, model, and project over several years the effects of pest outbreaks and management activities on visual resources. This ability to visualize different potential future forest conditions can help resource managers plan projects, envision long-term ramifications, and interact with the public, and can facilitate research on human perception and recreational behavior.

Lyons, D. B.; Liebhold, A. M. 1992. **Spatial distribution and hatch times of egg masses of gypsy moth (Lepidoptera: Lymantriidae).** Environmental Entomology. 21(2): 354-358.

Timing of gypsy moth egg hatch is difficult to predict. The influence of the position of egg masses of the gypsy moth on a tree bole on hatching time was investigated. Although eggs were deposited predominantly on the eastern sides of tree boles, egg hatch was most advanced in masses located on southern sides. There was no strong relationship between height on the tree bole and rate of egg hatch, especially for the lower portion of the bole. Eggs deposited under bark flaps experienced a significant delay in hatching compared with eggs deposited on the bark surface.

Maddox, J. V.; McManus, M. L.; Jeffords, M. R.; Webb, R. E. 1992. **Exotic insect pathogens as classical biological control agents with an emphasis on regulatory considerations.** In: Kauffman, W. C.; Nechols, J. E., eds. Selection criteria and ecological consequences of importing natural enemies; proceedings; New Orleans, LA. Lanham, MD: Entomological Society of America. 27-39.

Although insect pathogens are important naturally occurring biological control agents of insects, few exotic insect pathogens have been intentionally introduced into the United States, partly because pathogens are more difficult to recognize and isolate in a foreign country than are parasitoids and predators, and because pathogens generally have not been considered an integral part of the foreign exploration and introduction concept. Other reasons include taxonomic uncertainty and many undescribed species within many insect pathogen groups, lack of detailed

information on biological characteristics such as host specificity and ecological interactions, little scientifically based information on what characteristics should be used to select the most appropriate exotic pathogen for introduction, and ambiguous regulatory requirements.

Marquis, David A. 1992. **Accommodating biological and social issues in hardwood management: the Northeast region.** In: Proceedings: 20th annual hardwood symposium of the Hardwood Research Council; 1992 June 1-3; Cashiers, NC. Memphis, TN: Hardwood Research Council: 111-125.

Discusses why multiple-use management has not adequately addressed public concerns over forest land use, changes needed in silvicultural practices and management philosophy to address these concerns, and what is being done in the Northeast.

Marquis, David A. 1992. **Stand development patterns in Allegheny hardwood forests, and their influence on silviculture and management practices.** In: Kelly, Matthew J.; Larsen, Bruce C.; Oliver, Chadwick D., eds. The ecology and silviculture of mixed-species forests. Boston: Kluwer Academic Publishers: 165-181.

Management of Allegheny hardwood forests is complicated by difficulties in securing adequate regeneration and problems in regulating current stands to maximize benefits. An understanding of the history and origin of present stands plus a knowledge of typical stand development patterns can provide the basis for appropriate silvicultural practices.

Marquis, David A.; Ernst, Richard L. 1992. **User's guide to SILVAH: stand analysis, prescription, and management simulator program for hardwood stands of the Alleghenies.** Gen. Tech. Rep. NE-162. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 124 p.

Describes the purpose and function of the SILVAH computer program, provides detailed instructions on use of the program, and discusses program organization, data formats, and the basis of processing algorithms.

Marquis, David A.; Ernst, Richard L.; Stout, Susan L. 1992. **Prescribing silvicultural treatments in hardwood stands of the Alleghenies (revised).** Gen. Tech. Rep. NE-96. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 101 p.

Summarizes the results of 20 years of research and experience in the silviculture of hardwood forests in the Allegheny region, and provides guidelines, decision tables, and step-by-step instructions for determining silvicultural prescriptions in individual stands in this region.

Marquis, David A.; Stout, Susan L. 1992. **Multiresource silvicultural decision model for forests of the northeastern United States.** In: Murphy, Dennis, comp. Getting to the future through silviculture--workshop proceedings; 1991 May 6-9; Cedar City, UT. Gen. Tech. Rep. INT-291. Ogden, UT: U.S. Department of

- Agriculture, Forest Service, Intermountain Forest and Range Experiment Station: 54-61.
- A computerized decision model is under development for forests of the Northeastern United States that provides expert support for land managers charged with developing silvicultural prescriptions to achieve a variety of timber, water, wildlife, esthetic, and environmental goals. Data on forest vegetation, site conditions, and management objectives are the basis for management recommendations generated by the NE Decision Model. Users also can compare the recommended treatment and other alternatives through the stand-growth simulators incorporated into the program: analysis of economic returns and effects on forest stand development, wildlife habitat suitability, visual conditions, water yields, and environmental considerations.
- May, Dennis M.; LeDoux, Chris B. 1992. **Assessing timber availability in upland hardwood forests.** Southern Journal of Applied Forestry. 16(2):82-88.
- A procedure has been developed for assessing timber availability from reported inventory statistics for upland hardwood forests. The procedure uses forest inventory and ownership statistics, a stump-to-mill cost prediction model developed by the USDA Forest Service's Northeastern Forest Experiment Station, and published wood price reports.
- McFadden, M. W. 1992. **A framework for forest IPM research.** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings, North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station: 125-126. Abstract.
- McFadden, Max W., mod. 1992. **International forestry opportunities and challenges for North American forest entomologists and pathologists.** In: Allen, Douglas D.; Abrahamson, Lawrence P., tech. eds. Proceedings: North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-GTR-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 94.
- McManus, M. L., mod. 1992. **Future of microbial pesticides.** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings: North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-GTR-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 98-101.
- McManus, M. L. 1992. **Gypsy moth management in the United States.** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings, North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station: 123-124. Abstract.
- McPherson, E. Gregory. 1992. **Shading urban heat islands in U.S. desert cities.** Sonderdruck aus Wetter und Leben. 44: 107-123.
- McPherson, E. Gregory. 1992. **Accounting for benefits and costs of urban greenspace.** Landscape and Urban Planning. 22: 41-51.
- Urban greenspace provides many environmental and social services that contribute to the quality of life in cities. Economic approaches used to estimate value of greenspace services include travel cost, willingness to pay, hedonic pricing, and tree valuation. These methods have limited utility for policymakers, planners, and managers because the underlying values they estimate only indirectly reflect the flow of multiple benefits and costs. A greenspace accounting approach to partially address this deficiency is described using benefit-cost analysis for a proposed tree-planting project in Tucson, Arizona. The approach directly connects vegetation structure with the spatial-temporal flow of functional benefits and costs.
- McPherson, E. Gregory. 1992. **Benefits and costs of planned tree plantings in twelve U.S. cities.** Journal of Arboriculture. 18(6): 330. Abstract.
- McPherson, Greg. 1992. **Environmental benefits and costs of the urban forest: two examples from Tucson, Arizona.** In: McCulloch, J., ed. Proceedings of international conference on cities and global change; 1991 June 12-14; Toronto, ON. Washington, DC: Climate Institute: 218-224.
- McPherson, Greg. 1992. **Putting research to work.** Urban Forests. 12(5): 5.
- McQuattie, Carolyn J. 1992. **Cytological effects of lead and zinc on mycorrhizal roots of *Pinus rigida*.** Ohio Journal of Science. 92(2): 15. Abstract.
- McQuattie, C. J.; Schier, G. A. 1992. **Effect of ozone and aluminum on pitch pine (*Pinus rigida*) seedlings: anatomy of mycorrhizae.** Canadian Journal of Forest Research. 22(12): 1901-1916.
- Newly germinated pitch pine seedlings inoculated with a mycorrhizal fungus (*Pisolithus tinctorius* (Pers.) Coker & Couch) were grown for 13 weeks in sand irrigated with nutrient solution (pH 4.0) containing 0, 12.5, 25, or 50 mg/L aluminum (Al) in growth chambers fumigated with 0, 50, 100, or 200 ppb ozone. Anatomical changes in roots stressed by ozone and Al, singly and in combination, were determined by light and electron microscopy. All ozone concentrations reduced the percentage of mycorrhizal colonization. By contrast, Al increased the percentage of colonization at low concentration, reducing it only at the highest level. Aluminum caused more overall deterioration of root cortex than ozone, though both treatments adversely affected the mycorrhizal fungus.
- McWilliams, W. H.; Wharton, E. H. 1992. **Landscape-level arboreal data for forested wetlands: the U.S. Forest Service regional inventories.** In: Global wetlands old world and new: INTECOL's 4th international wetland conference; 1992 September 13-18; Columbus, OH. Columbus, OH: Ohio State University: 90. Abstract.

- McWilliams, William H.; Birch, Thomas W. 1992. **Who owns U.S. timber?** National Woodlands. 15(4): 16-18. Describes private forest-land owners and their role in the resource supply, and summarizes the character of nonindustrial private timberland management.
- McWilliams, William H.; Mills, John R. 1992. **Status of forest resources in the United States.** In: The American Bar Association section of natural resources, energy, and environmental law: private sector timberland issues; 1992 May 8; New Orleans, LA. [Place of publication unknown]: [Publisher name unknown]. Provides a synopsis of national and regional resource statistics and a brief analysis of notable trends.
- Mendoza, G. A.; Meimban, R. J.; Luppold, W. G.; Araman, P. A. 1992. **Combining simulation and optimization models for hardwood Lumber production.** In: Pacific Rim forestry--bridging the world. Proceedings of the Society of American Forests national convention; 1991 August 4-7; San Francisco, CA. SAF Publ. 91-05; Bethesda, MD: Society of American Foresters: 356-361.
- Mendoza, Guillermo A.; Meimban, Roger J.; Araman, Philip A.; Luppold, William G. 1992. **Combined log inventory and process simulation models for the planning and control of sawmill operations.** In: Proceedings, 23rd CIRP international seminar on manufacturing systems; 1991 June 6-7; Nancy, France. [Place of publications unknown]: [Publisher name unknown].
- Mercer, Melissa; Slavicek, James M. 1992. **Comparison of methods for the generation of recombinant *Lymantria dispar* nuclear polyhedrosis virus in the 652Y cell line.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 61-62. Abstract.
- Mierzejewski, Karl; Nealen, Paul; Maczuga, Steven; Yendol, William; McManus, Michael. 1992. **Spray deposit assessment system.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 32. Abstract.
- Miller, D. R.; Yendol, W. G.; McManus, M. L. 1992. **Field sampling of pesticide spray distributions using Teflon spheres and fiat cards.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 36. Abstract.
- Minocha, Rakesh; Minocha, Subhash C.; Long, Stephanie L.; Shortle, Walter C. 1992. **Effects of aluminum on DNA synthesis, cellular polyamines, polyamine biosynthetic enzymes and inorganic ions in cell suspension cultures of a woody plant, *Catharanthus roseus*.** Physiologia Plantarum. 85: 417-424. This study is an attempt to understand the effects of Al stress on DNA synthesis, cellular polyamine levels and their biosynthetic enzymes, and uptake of inorganic ions in suspension cultures of a woody plant, *Catharanthus roseus*. Cell cultures of *C. roseus* are highly suited for such studies because of the availability of a vast amount of biochemical and molecular data on these cells.
- Montgomery, Michael. 1992. **Asian gypsy moth research update.** In: 66th meeting, National Plant Board; 1992 July 26-29; Portland, ME. [Place of publication unknown]: National Plant Board: 119-120.
- Montgomery, Michael E. 1992. **Why are gypsy moth numerical dynamics so irregular in North America?** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings: North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-GTR-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 35-36.
- Montgomery, Michael E. 1992. **Why is the gypsy moth doing so well in North America?** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings, North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station: 73. Abstract.
- Montgomery, Michael E.; Wallner, William E. 1992. **Insect pests of larch in Asia and their threat to larch in North America.** In: Ecology and management of Larix forests: a look ahead; 1992 October 5-9; Whitefish, MT. Missoula, MT: University of Montana: 25. Abstract.
- More, Thomas A.; Averill, James R. 1992. **Satisfaction, happiness, and emotion in the recreation experience: are we asking the right questions?** Chavez, Deborah J., tech. coord. Proceedings of the symposium on social aspects and recreation research: summary of round table session; 1992 February 19-22; Ontario, CA. Gen. Tech. Rep. PSW-GTR-132. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 84 p.
- Muzika, R. M.; Pregitzer, K. S. 1992. **Effect of nitrogen fertilization on leaf phenolic production of grand fir seedlings.** Trees. 6: 241-244. A significant decrease in production of total phenolics was apparent with nitrogen fertilization in three of five seed sources of grand fir. Subsequent extraction and identification of phenolics indicated that two compounds increased with fertilization. When these were grouped by biosynthetic origin into cinnamic acids, benzoic acids, and

flavonoids, there were no apparent differences with fertilization. Total biomass increased with fertilization, and the relation between growth and total phenolics was similar for all seed sources.

Nagarajan, Maha; Hiremath, Shiv; Lehtoma, Kirsten. 1992. **A recombinant probe representing gypsy moth vitellogenin messenger RNA.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 34. Abstract.

Nicholas, N. S.; Zedaker, S. M.; Eagar, C. 1992. **A comparison of overstory community structure in three southern Appalachian spruce-fir forests.** Bulletin of the Torrey Botanical Club. 119(3): 316-332.

Nicholas, N. S.; Zedaker, S. M.; Eagar, C.; Bonner, F. T. 1992. **Seedling recruitment and stand regeneration in spruce-fir forests of the Great Smoky Mountains.** Bulletin of the Torrey Botanical Club. 119(3): 289-299.

Northeastern Forest Experiment Station. 1992. **Publications of the Northeastern Forest Experiment Station: 1989 and 1990.** Gen. Tech. Rep. NE-163. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 63 p. An annotated list of publications by Northeastern Forest Experiment Station scientists and cooperators in 1989 and 1990.

Northeastern Forest Experiment Station. 1992. **How to prepare manuscripts for Station publication.** Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 54 p. Provides instructions for authors and typists in the preparation of manuscripts intended for Station publication: Research Papers, Research Notes, Resource Bulletins, and General Technical Reports.

Nolley, Jean W. 1992. **Bulletin of hardwood market statistics: fall 1991.** Res. Note NE-348. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 47 p. Provides current and historical information on primary and secondary hardwood product production, prices, international trade, and employment.

Nolley, Jean W. 1992. **Bulletin of hardwood market statistics: winter 1991.** Res. Note NE-349. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 43 p.

Nolley, Jean W. 1992. **Bulletin of hardwood market statistics: spring 1992.** Res. Note NE-350. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 43 p.

Nolley, Jean W. 1992. **Bulletin of hardwood market statistics: summer 1992.** Res. Note NE-351. Radnor,

PA: U. S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 43 p.

Nowak, D. J. 1992. **Remote sensing and urban forestry.** In: American forestry--an evolving tradition: proceedings of the 1992 Society of American Foresters national convention; 1992 October 25-28; Richmond, VA. SAF Publ. 92-01. Bethesda, MD: Society of American Foresters: 103-108.

Explores remote sensing techniques as applied in urban areas and the advantages and limitations of these techniques when used in urban forestry.

Nowak, David J. 1992. **The evolution of Oakland's urban forest.** Journal of Arboriculture. 18(6): 329. Abstract.

Nowak, David J. 1992. **"Smog check your trees": clouding the issue.** Arborist News. 1(1): 13,15. The article "Smog Check Your Trees" has raised many concerns about the detrimental influences of trees. Arborists must be prepared to address these concerns.

Nowak, David J.; McBride, Joe R. 1992. **Differences in Monterey pine pest populations in urban and natural forests.** Forest Ecology and Management. 50: 133-144. Monterey pines planted along streets within Carmel, California, and immediate vicinity and naturally grown Monterey pine within adjacent native stands were sampled with regard to intensity of visual stress characteristics, infection by western dwarf mistletoe and western gall rust, and frequency of attacks by sequoia pitch moth and red turpentine beetle. The street trees were stratified into one highly urban zone, two urban zones, and one suburban zone. Dwarf mistletoe infections generally were more common in the forest stand than on street trees in the highly urban and urban zones. Pitch moth attacks were more common in all street tree zones than the natural forest. Red turpentine beetle attacks were positively correlated with stress and diameter, and may follow pitch moth attacks.

Nowak, David J.; Sydnor, T. Davis. 1992. **Popularity of tree species and cultivars in the United States.** Gen. Tech. Rep. NE-166. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 44 p.

A survey of what species and cultivars tree nurseries offer for sale was analyzed to indicate relative species and cultivar popularity by geographical region for 1980, 1983 and 1986. In all, 217 taxon (cultivars and noncultivated varieties) from 106 tree species were analyzed and ranked according to geographical and national popularity. In 1986, the most popular taxon nationally were *Pyrus calleyana* "Bradford", *Quercus palustris*, *Acer rubrum*, *Acer rubrum* 'Red Sunset', and *Fraxinus pennsylvanica* 'Marshall Seedless'.

ODell, T. M. 1992. **Straggling in gypsy moth production strains: a problem analysis for developing research priorities.** In: Anderson, Thomas E.; Leppla, Norman C., eds. Advances in insect rearing for research and pest management. Boulder, CO. Westview Press: 325-352.

Summarizes the historical and biological events that shaped the present gypsy moth rearing system, reviews the recorded occurrence and investigation of straggling, and evaluates rearing protocols in the context of what is known about performance of gypsy moth in natural environments.

ODell, Thomas M.; Xu, Chong-Hua; Schaefer, Paul W.; Leonhardt, Barbara A.; Yao, De-Fu; Wu, Xiang-De. 1992. **Capture of gypsy moth, *Lymantria dispar* (L.), and *Lymantria mathura* (L.) males in traps baited with disparlure enantiomers and olefin precursor in the Peoples Republic of China.** Journal of Chemical Ecology. 18(12): 2153-2159.

Pheromone traps baited with (+)-disparlure, cis-7,8-epoxy-2-methylocta-decane, captured males of *Lymantria dispar*, *L. monacha*, and *L. mathura* in northeastern People's Republic of China. *L. dispar* responded to the addition of olefin to (+)-disparlure-baited traps in a negative dose-response manner. Observations on site and seasonal capture of *L. dispar* and *L. mathura* are discussed.

Peacock, John; Talley, Stephen; Williams, Taylor; Reardon, Richard. 1992. **Laboratory and field studies on the effects of *Bacillus thuringiensis* on non-target lepidoptera.** Gypsy Moth News. 28: 7-8. Abstract.

Peacock, John W.; Schweitzer, Dale F. 1992. **Toxicity of Bt to larvae of non-target Lepidoptera in laboratory bioassay.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 35. Abstract.

Percy, K. E.; Jensen, K. F.; McQuattie, C. J. 1992. **Effects of ozone and acidic fog on red spruce needle epicuticular wax production, chemical composition, cuticular membrane ultrastructure and needle wettability.** New Phytologist. 122: 71-80.

Peters, Penn A. 1992. **The effects of stand geometry on felling hazards.** ASAE Pap. 927507. St. Joseph, MI: American Society of Agricultural Engineers. 9 p.

Peters, Penn A. 1992. **A forestry perspective.** In: Papers and proceedings of the Surgeon General's conference on agricultural safety and health--1991. NIOSH Publ. 92-105. Cincinnati, OH; National Institute for Occupational Safety & Health: 317-320.

Podgwaite, John D. 1992. **Gypchek production in vivo.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 44. Abstract.

Podgwaite, John D.; Reardon, Richard C. 1992. **Evaluation of Gypchek applied at low dosage and volume.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings,

U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 36. Abstract.

Podgwaite, John D.; Reardon, Richard C.; Walton, Gerald S.; Venables, Lee; Kolodny-Hirsch, Douglas M. 1992. **Effects of aerially applied Gypchek on gypsy moth (Lepidoptera: Lymantriidae) populations in Maryland woodlots.** Journal of Economic Entomology. 85(4): 1136-1139.

Moderate- to high-density gypsy moth populations in eastern and northern Maryland were aerially treated with the nucleopolyhedrosis virus product Gypchek. A tank mix containing Orzan LS (6 percent wt/vol) as a sunlight protectant, Pro Mo liquid supplement (12.5 percent by vol) as a feeding stimulant and humectant, and Rhoplex B60A (2 percent by vol) as a sticker was applied twice to nine woodlots at the rate of 18.7 liters and 1.25 x 10¹² polyhedral inclusion bodies per ha per application. Compared with numbers in control woodlots, this rate reduced numbers of egg masses by 98 percent in eastern Maryland, and by 80 percent in northern Maryland.

Podgwaite, J.D.; Reardon, R.C.; Walton, G.S.; Witcosky, J. 1992. **Efficacy of aerially-applied Gypchek against gypsy moth (Lepidoptera: Lymantriidae) in the Appalachian highlands.** Journal of Entomological Science. 27(4): 337-344.

Gypsy moth populations in six northern Virginia plots were aerially treated with the nucleopolyhedrosis virus product Gypchek. Two applications reduced larvae by more than 92 percent and egg masses by more than 94 percent. Defoliation averaged 22 percent in Gypchek-treated plots compared to 67 percent in control plots.

Pouyat, Richard V.; Zipperer, Wayne C. 1992. **The uses and management of urban woodlands.** In: Rodbell, Phillip D., ed. Proceedings of the 5th national urban forest conference: alliances for community trees; 1991 November 12-17; Los Angeles, CA. Washington, DC: American Forestry Association: 26-29.

Within urban landscapes there are woodlands that provide ecological and environmental benefits to neighboring areas. However, because of their proximity to human activities, these forests are being altered in structure and function. The most efficient course of management is to maintain the functioning of natural processes and control direct human impacts on the woodland.

Proctor, Noble S.; Smith, Harvey R.; Wallner, William E. 1992. **Birding in the former Soviet Union: Moscow and Minsk.** Birding. 24(6): 356-362.

Profous, George V. 1992. **Trees and urban forestry in Beijing, China.** Journal of Arboriculture. 18(3): 145-154. Management practices, nursery production, public preferences, historical development, and land use influence species composition, diameter size, and forest distribution in Beijing, China. (*Populus*, *Sabina*, *Sophora* and *Robinia*) comprise nearly 55 percent of the trees inventoried. Since

1949, greenspace in Beijing has increased dramatically. Older trees surviving from earlier planting eras are found primarily in older residential and institutional areas.

Racin, G. E.; Colbert, J. J. 1992. **Interface management system for the stand-damage model.** In: Watson, Dennis G.; Zazueta, Fedro S.; Bottcher, A. B., eds. Computers in Agricultural extension programs: Proceedings, 4th international conference; 1992 January 28-31; Orlando, FL. ASAE Publ. 1-92: St. Joseph, MI: American Society of Agricultural Engineers: 411-416.

This paper describes the Gypsy Moth Stand-Damage Model interface. The Damage model predicts the number and size of trees in a stand over time while being subjected to defoliation and silvicultural management. The interface provides user-friendly access to, and control of the model. The software provides the means to manipulate files, view and manage outputs, and edit input data. Management of stand-damage data made it necessary to define structures to store data and provides the mechanisms to manipulate these data. The interface is written in the C language for DOS microcomputers.

Racin, George; Colbert, J. J. 1992. **Current status of the stand damage portion of the Gypsy Moth Life System Model.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 39. Abstract.

Radloff, David L.; Barnard, Joseph E.; Brooks, Robert T.; Loomis, Robert C. 1992. **Monitoring the health of forest ecosystems in the U.S.A.** In: Tesche, M.; Feiler, S., eds. Proceedings, air pollution and interactions between organisms in forest ecosystems; 1992 September 9-11; Dresden, Germany. Dresden, Germany: Technische Universitat Dresden: 49-53.

Reardon, R. C.; Podgwaite, J. D.; Cunningham, J. C. 1992. **Advances in application methods, formulation and user strategies for gypsy moth virus.** In: Programs & Abstracts of the 25th annual meeting of the Society for Invertebrate Pathology; 1992 August 16-21; Heidelberg, Germany. [Place of publication unknown]: [Publisher name unknown]. Abstract.

Rebeck, J.; Jensen, K. F.; Greenwood, M. S. 1992. **Ozone effects on the growth of grafted mature and juvenile red spruce.** Canadian Journal of Forest Research. 22: 756-760.

Grafted juvenile and mature scions of red spruce were grown in open-top chambers at a low-elevation site in central Maine to determine if developmental age of tissue affects response to oxidant pollution. After 18 weeks of ozone exposure, grafted red spruce showed little or no growth response to ozone. No significant ozone effect on biomass production was measured, though there were significant difference between juvenile and mature scions. At the final harvest, juvenile scion stem, stem needles, branches,

branch needles, and roots had 60, 18, 74, 73, and 35 percent more dry weight, respectively, than mature scions.

Rebeck, Joanne; Loats, Ken. 1992. **Does ozone preconditioning affect the response of hardwoods to ozone?** Ohio Journal of Science. 92(2): 16. Abstract.

Rebeck, Joanne; Loats, Ken. 1992. **The photosynthetic response of yellow poplar [yellow-poplar] (*Liriodendron tulipifera*) to two seasons of ozone exposure.** In: Tesche, M.; Feller, S., eds. Proceedings, air pollution and interactions between organisms in forest ecosystems: IUFRO 15th international meeting of specialists in air pollution effects on forest ecosystems; 1992 September 9-11; Dresden, Germany. Dresden, Germany: Technische Universitat Dresden: 45. Abstract.

Reed, David D.; Jones, Elizabeth A.; Holmes, Michael J.; Fuller, Leslie G. 1992. **Modeling diameter growth in local populations: a case study involving four North American deciduous species.** Forest Ecology and Management. 54: 95-114.

Many existing models representing the growth of forest overstory species as a function of environmental conditions make a number of assumptions which are inappropriate when applied to local populations. For example, maximum tree diameter and height are often assumed to be constant limiting factors for a given species even though growth functions can often be localized by utilizing information in the forest growth and yield literature to make site-specific estimates of these values. Most existing models also use an annual timestep which may be inappropriate when attempting to model the growth response of individual trees to environmental conditions. In this study, a model utilizing a weekly timestep is described and applied to four widespread North American deciduous tree species. Because response to environmental conditions can vary regionally as a result of genetic heterogeneity, the resulting model should not be considered as universally appropriate for these species. This study illustrates methods which can be utilized to develop models for applications to local populations.

Riegel, Christopher I.; Slavicek, James M. 1992. **Cloning and sequencing of a gene from *Lymantria dispar* nuclear polyhedrosis virus with homology to the *Autographa californica* nuclear polyhedrosis virus ecdysteroid UDP-glucosyl transferase gene.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture, interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 62-63. Abstract.

Roberts, Bruce R.; Cannon, William N., Jr. 1992. **Growth and water relationships of red spruce seedlings exposed to atmospheric deposition and drought.** Canadian Journal of Forest Research. 22(2): 193-197. Two-year-old containerized seedlings of red spruce were subjected to ozone (O₃) fumigation (0.25 ppm), simulated acid rain (pH 4.2 or 3.0), and drought prior to measurement of changes in growth and plant water. Drought caused a

significant decline in terminal height growth and new-shoot dry weight, but old-shoot dry weight, root dry weight, and root/shoot ratio were not appreciably affected. Deposition treatment influenced both shoot and root dry weight but did not significantly affect height or root/shoot ratio. Treatment with 0.25 ppm O₃ alone or pH 3.0 rainfall alone caused the greatest reduction in growth, while treatment with 0.25 ppm O₃ + pH 4.2 rain had the least effect.

Sampson, R. Neil; Rowntree, Rowan. 1992. **The living city.** In: Rodbell, Phillip D., ed. Proceedings of the 5th national urban forest conference: alliances for community trees; 1991 November 12-17; Los Angeles, CA. Washington, DC: American Forestry Association: 16-21.

An ecological approach to planning and managing the urban forest requires a broadening of spatial and temporal scales to capture all benefits and costs, including those occurring as the urban forest displaces wildland forests at the edge of expanding cities.

Sanchez, Vicente. 1992. **Enzyme profiles and genetic variation in *Compsilura concinnata* (Diptera: Tachinidae).** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 41-42. Abstract.

Schaefer, Paul W.; Wallner, William E. 1992. **Asian gypsy moth (AGM) bioecology: comparisons with North American gypsy moth and other species of *Lymantria*.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 42-43. Abstract.

Schier, George A.; Jensen, Keith F. 1992. **Atmospheric deposition effects on foliar injury and foliar leaching in red spruce.** In: Eager, Christopher; Adams, Mary Beth, eds. Ecology and decline of red spruce in the Eastern United States. Ecological Studies 96. New York: Springer-Verlag: 271-294.

Reviews information on the effects of acidic deposition and gaseous pollution on foliar injury and foliar leaching in red spruce.

Sendak, Paul E.; Tritton, Louise M.; Martin, C. Wayne. 1992. **Interdisciplinary forest management.** In: Maple syrup production: proceedings of the North American Maple Syrup Council technical session; 1990 October; Batavia, NY. NRAES-62. [Place of publication unknown]: Northeast Regional Agricultural Engineering Service: 20-29.

The following questions are considered: (1) What patterns of crown dieback and tree mortality can be discerned from a systematic study of forest ecosystems? (2) What possible explanations, including forest decline, could there be for these patterns? (3) What can the forest manager do, through management activities or changing expectations of

productivity for the property, to increase the likelihood of meeting his or her objectives? (4) What role does the scientific community play in guiding management activities and creating expectations?

Sendak, Paul E. 1992. **State and federal timber stumpage prices in Vermont.** Northern Journal of Applied Forestry. 9(3): 97-101.

Timber-sales data and stumpage prices were analyzed for the Green Mountain National Forest and the Vermont Department of Forests, Parks and Recreation. State stumpage prices were higher on average, but significantly so only for the overall price (volume weighted average sale price per unit), spruce sawtimber, and hardwood and softwood pulpwood. Differences between mean state and federal prices for sugar maple and yellow birch sawtimber were not significant.

Sharov, A. A.; Colbert, J. J. 1992. **Current status of the Gypsy Moth Life System Model.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 45-46. Abstract.

Sheehan, Katharine A. 1992. **User's guide for GMPHEN: a gypsy moth phenology model.** Gen. Tech. Rep. NE-158. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 29 p. GMPHEN is a flexible, menu-driven computer model that uses daily temperatures and previously published data to predict the timing of gypsy moth and host development. This model simulates gypsy moth egg hatch, larval and pupal development, and budbreak and leaf expansion for six eastern hardwoods. This guide contains instructions for using GMPHEN and presents examples of model simulations.

Shields, Kathleen S. 1992. **Nephrocytes of the gypsy moth, *Lymantria dispar*.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 46-47. Abstract.

Shortle, Walter C.; Bondietti, Ernest A. 1992. **Timing, magnitude, and impact of acidic deposition on sensitive forest sites.** Water, Air, and Soil Pollution. 61: 253-267.

Adverse effects of acidic deposition on forest health are most likely to occur in forests that develop a thick raw or "mor" humus layer in which the cation exchange capacity is highly sensitive to acid input. A study of the trend of exchangeable Ca and Mg ions in sensitive humus layers over the past six decades indicates a downward shift in equilibrium that is consistent with theories of ion mobilization and coincident in time with increasing acidic deposition in the mid-1900's. Independent records of a base cation mobilization in wood

supports the view of a change in the root zone in sensitive forest sites and in lake water chemistry.

Simpson, Brian T.; Wiant, Harry V., Jr. 1992. **Accuracy of timber trespass cruises.** Northern Journal of Applied Forestry. 9(1): 35-36.

The study reported here is a portion of a thesis done to evaluate the accuracy of timber trespass cruises.

Sisinni, Susan M.; Emmerich, Anthony. 1992. **Methodologies, results and applications of natural resource assessments in New York City, New York.** In: Hedge, Cloyce, ed. Proceedings, 19th annual natural areas conference; 1992 October 27-30; Bloomington, IN. Bloomington, IN: Indiana University: 53. Abstract.

Slavicek, James M. 1992. **A functional gene map of the *Lymantria dispar* nuclear polyhedrosis virus (LdNPV): the organization of the LdNPV genome is non collinear to that of the *Autographa californica* nuclear polyhedrosis virus (AcNPC).** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 46-47. Abstract.

Slavicek, James M. 1992. **Baculoviruses: production strategies and prospects for genetic engineering.** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings, North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station: 102-103. Abstract.

Slavicek, James M. 1992. **Enhancement of *Lymantria dispar* nuclear polyhedrosis virus potency and production in cell culture to facilitate its widespread use for gypsy moth control.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 63-64. Abstract.

Slavicek, James M.; Podgwaite, John. 1992. **Analysis of *Lymantria dispar* nuclear polyhedrosis viruses (LdNPV) isolated from Gypchek: purification of high potency LdNPV isolates.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 47-48. Abstract.

Slavicek, James M.; Podgwaite, John; Lanner-Herrera, Carita. 1992. **Properties of two *Lymantria dispar* nuclear polyhedrosis virus isolates obtained from the**

microbial pesticide Gypchek. Journal of Invertebrate Pathology. 59: 142-148.

Two *Lymantria dispar* nuclear polyhedrosis virus isolates, 5-6 and A2-1, differing in the phenotypic characteristic of the number of viral occlusions in infected cells, were obtained from a production lot of the microbial pesticide Gypchek, and several of their replication properties were investigated and compared. Budded virus titer produced in cell culture polyhedral inclusion body production in cell culture and in vivo, the number of virions present within occlusion body cross sections, and potency determinations suggest that isolate 5-6 is a few polyhedra plaque variant and that A2-1 is a many polyhedra wild-type isolate.

Smith, Harvey R.; Cook, Steven P.; Hastings, Felton L.; Hain, Fred P. 1992. **Population fluctuations and potential impact of small mammal predators of gypsy moth.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 48-49. Abstract.

Smith, Kevin T. 1992. **The art of tree pruning.** Arbor Age. 12(3): 42.

Every pruning cut is a judgment call. There is no simple one-size-fits-all prescription. Fortunately, each cut becomes easier when you know why we prune and how trees grow. We prune trees to reduce existing hazards and to improve tree appearance. We also should prune trees to reduce future hazards. Extensive, radical large-limb or stem pruning often is necessary because of previous neglect or poor pruning.

Smith, Marie-Louise. 1992. **Habitat type classification and analysis of upland northern hardwood forest communities on the Middlebury and Rochester Ranger Districts, Green Mountain National Forest, Vermont.** In: Proceedings national workshop: taking an ecological approach to management; 1992 April 27-30; Salt Lake City, UT. WO-WSA-3. Washington, DC: U.S. Department of Agriculture, Forest Service: 161. Abstract.

Smith, Paul M.; West, Cynthia D. 1992. **A strategic framework for globally-oriented wooden furniture manufacturers: an emphasis on South Korea.** In: Youn, Yeo Chang; Schreuder, Gerard F., eds. International trade in forest products around the Pacific Rim; 1991 October 8-11; Seoul, Korea. Seoul, Korea: Seoul National University, College of Agriculture & Life Sciences: 99-121.

Smith, Stephen C.; Twardus, Daniel B. 1992. **CALIBRATOR—an aircraft calibration tool.** Gypsy Moth News. 29: 5.

CALIBRATOR is software written for the TI-95 programmable calculator that turns the calculator into a spray aircraft calibration aid.

Solomon, Dale S.; Brann, Thomas B. 1992. **Ten-year impact of spruce budworm on spruce-fir forests of**

- Maine.** Gen. Tech. Rep. NE-165. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 44 p.
 Annual measurements from 1975 to 1985 on 278 Maine spruce-fir plots infested by the spruce budworm were analyzed by forest type, density, host-species composition, diameter, and percent fir or spruce composition classes to determine impact on growth and mortality. In 1985, balsam fir, one-fourth of the initial 1975 basal area per acre had 50 percent mortality in mixedwood and 75 percent in softwood types. Spruce mortality was 3 times higher in the softwood than in the mixedwood type. Balsam fir mortality increased with increasing basal-area density. The heaviest losses in the mixedwood stands usually occurred about 4 years after those in the softwood stands.
- Solomon, Dale S.; Holmes, Michael J.; Leak, William B. 1992. **Measured and predicted growth rates in mixed-species northern hardwood stands in the northeastern United States.** In: Proceedings: IUFRO S4.01 "Mensuration, growth and yield"; 1992 August 31-September 4; Berlin, Germany. Freising, Germany: Hanskarl Goettling Stiftung: 153-161.
 Twenty-five years of growth in a northern hardwood stand treated to four levels of stand density and three levels of percent sawtimber were compared to predictions by the models NE-TWIGS and FIBER. Projections by TWIGS and FIBER tended to be low, especially at low stand densities, due to underestimation of the increased ingrowth occurring 10 to 15 years following heavy reduction in basal area. In some cases, mortality by species was underestimated as well. Difficulties in predicting ingrowth and mortality can be addressed by incorporating a refined site or habitat classification systems that will better reflect species-specific growth patterns.
- Solomon, Dale S.; Holmes, Michael J.; Leak, William B. 1992. **Measured and predicted growth rates in mixed-species northern hardwood stands in the northeastern United States.** In: Preuhlsler, Teja, ed. Research on growth and yield with emphasis on mixed stand: proceedings, IUFRO centennial meeting; 1992 August-September 4; Berlin/Eberswalde, Germany. Berlin, Germany: International Union Forestry Research Organization: 153-161.
- Stephenson, Steven L.; McQuattie, Carolyn J.; Edwards, Pamela J.; Studlar, Susan M. 1992. **The effect of acidification on the bryophytes associated with mountain streams.** In: Smith, Elizabeth R., ed. Proceedings, 3rd annual southern Appalachian man and the biosphere conference; 1992 November 9-10; Gatlinburg, TN. TVA/LR/ERM-92/2. Norris, TN: Tennessee Valley Authority: 66. Abstract.
- Stout, Susan L. 1992. **Herbicide effects in a study of management strategies in Allegheny hardwoods.** In: Bellinder, R. R., ed. Proceedings of the 46th annual meeting of the Northeastern Weed Science Society; 1992 January 6-9; Boston, MA. Ithaca, NY: Northeastern Weed Science Society: 136. Abstract.
- Stout, Susan L.; Horsley, Stephen B.; deCalesta, David S. 1992. **Assessing plant species diversity: an important challenge in forest vegetation management.** In: Bellinder, R. R., ed. Proceedings of the 46th annual meeting of the Northeastern Weed Science Society; 1992 January 6-9; Boston, MA. Ithaca, NY: Northeastern Weed Science Society: 134. Abstract.
- Sundaram, Alam; Sundaram, K. M. S.; Dubois, N. R. 1992. **Deposition, persistence and fate of *Bacillus thuringiensis* var *kurstaki* in a hardwood forest, after aerial spraying of a commercial formulation at two dosage rates.** In: Proceedings, 19th international congress of entomology; 1992 June 28-July 4; Beijing, China. [Place of publication unknown]: [Publisher name unknown]: 564. Abstract.
- Thurston, Sally W.; Krasny, Marianne E.; Martin, C. Wayne; Fahey, Timothy J. 1992. **Effect of site characteristics and 1st- and 2nd-year seedling densities on forest development in a northern hardwood forest.** Canadian Journal of Forest Research. 22(12): 1860-1868.
- Tobi, Donald R.; Leonard, Jonathan G.; Parker, Bruce L.; Wallner, William E. 1992. **Survey methods, distribution, and seasonality of *Korscheltellus gracilis* (Lepidoptera: Hepialidae) in the Green Mountains, Vermont.** Environmental Entomology. 21(3): 447-452.
- Tobi, Donald R.; Parker, Bruce L.; Wallner, William E. 1992. **Feeding by *Korscheltellus gracilis* (Lepidoptera: Hepialidae) larvae on roots of spruce and fir.** Journal of Economic Entomology. 85(6): 2329-2335.
- Twery, Mark. 1992. **New tools for hazard rating, GIS and the gypsy moth.** In: Allen, Douglas C.; Abrahamson, Lawrence P., tech. eds. Proceedings, North American forest insect work conference; 1991 March 25-28; Denver, CO. Gen. Tech. Rep. PNW-294. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station: 69-70. Abstract.
- Twery, Mark J. 1992. **The Northeast decision model.** In: Proceedings, 20th annual hardwood symposium of the hardwood research council; 1992 June 1-3; Cashiers, NC. Memphis, TN: Hardwood Research Council: 127-130. Describes the Northeast Decision model, a computer-based, decision-support system being developed by the Northeastern Forest Experiment Station to provide expert recommendations on silvicultural prescriptions to optimize management of multiple resources on forests of the northeastern United States.
- Twery, M. J.; Elmes, G. A.; Schaub, L. P.; Foster, M. A.; Ravlin, F. W.; Saunders, M. C. 1992. **GypsES: a decision support system for gypsy moth management.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170.

- Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 50-52. Abstract.
- Twery, Mark J.; Feicht, David L.; Fosbroke, Sandra L. C. 1992. **Understory development following thinning and defoliation in West Virginia.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 53. Abstract.
- Twery, Mark J.; Feicht, David L.; Fosbroke, Sandra L. C. 1992. **Understory development following thinning and defoliation in West Virginia.** In: Gjerstad, Dean H.; Glover, Glenn R., eds. Program and abstracts from the international conference on forest vegetation management: ecology, practice and policy; 1992 April 27-May 1; Auburn, AL. Sch. For. Rep. 1992:1. Auburn, AL: Auburn University: 132. Abstract.
- Twery, Mark J.; Feicht, David L.; Fosbroke, Sandra L. C. 1992. **Understory development following thinning and defoliation in West Virginia.** Bulletin of the Ecological Society of America. 73(2): 370. Abstract.
- Tyree, Melvin T.; Alexander, John; Machado, Jose-Luis. 1992. **Loss of hydraulic conductivity due to water stress in intact juveniles of *Quercus rubra* and *Populus deltoides*.** Tree Physiology. 10(4): 411-415. Hydraulic conductivity was measured in seedlings of northern red oak and rooted scions of eastern cottonwood that had been droughted in pots. Results indicate that in situ dehydration produced a similar vulnerability curve (percent loss of conductivity versus water potential) to those previously obtained by bench-top dehydration of excised branches of eastern cottonwood and red oak.
- Tyree, Melvin T.; Wescott, Charles R.; Tabor, Christopher A.; Morse, Anne D. 1992. **Diffusion and electric mobility of KCl within isolated cuticles of *Citrus aurantium*.** Plant Physiology. 99: 1057-1061. Fick's second law has been used to predict the time course of electrical conductance change in isolated cuticles following the rapid change in bathing solution (CKI) from concentration C to 0.1 C. The theoretical time course is dependent on the coefficient of diffusion of KCl in the cuticle and the cuticle thickness. Experimental results, obtained from cuticles isolated from sour orange (*Citrus aurantium*), fit with a diffusion model of an isolated cuticle in which about 90 percent of the conductance change following a solution change is due to salts diffusing from polar pores in the wax, and 10 percent of the change is due to salt diffusion from the wax. Short and long time constants for the washout of KCl were found to be 0.11 and 3.8 hours, respectively.
- Tyree, Melvin T. and Yang, Shudong. 1992. **Hydraulic conductivity recovery versus water pressure in xylem of *Acer saccharum*.** Plant Physiology. 100: 669-676. Experiments were conducted to determine the influence of stem diameter, xylem pressure potential, and temperature on the rate of recovery of hydraulic conductivity in embolized stems of sugar maple. Recovery of conductivity was accompanied by an increase in stem water content as water replaced air bubbles and bubbles dissolved from vessels into the surrounding water. The time required for stems to go from less than 3 to 100 percent hydraulic conductivity increased approximately with the square of the stem diameter and increased with decreasing xylem pressure potential. Temperature had little influence on the rate of recovery of hydraulic conductivity.
- Valaitis, Algimantas P. 1992. **Purification and properties of three regulatory enzymes from the gypsy moth.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 51-52. Abstract.
- Valaitis, Algimantas P. 1992. **Use of concanavalin A in the purification of juvenile hormone esterase from the hemolymph and the fat body of *Lymantria dispar*.** Insect Biochemistry. 22(7): 639-648. A new method for the purification of juvenile hormone esterase exploits the ability of Sepharose-coupled concanavalin A to bind to glycoproteins. Preparation of homogenous esterase from the plasma of the gypsy moth was accomplished by a procedure employing polyethylene glycol precipitation, Superose-12 gel filtration, concanavalin A-Sepharose affinity chromatography and mono-Q FPLC. The 62 kDa plasma glycoprotein was purified 1325-fold by the four-step procedure with an 8 percent recovery of the original activity. A specific activity of 2650 nmol of juvenile hormone III (JH III) hydrolyzed per min per mg of protein at 28°C was determined for the purified enzyme.
- Valentine, Harry T.; Bealle, Catherine; Gregoire, Timothy G. 1992. **Comparing vertical and horizontal modes of importance and control-variate sampling for bole volume.** Forest Science. 38(1): 160-172. Vertical and horizontal modes of both importance and control-variate sampling for estimating merchantable and total volumes of boles are described and compared. In the horizontal mode, heights are selected at random, and cross-sectional areas are measured. In the vertical mode, cross-sectional areas are selected at random and heights are measured. Estimates obtained by horizontal and vertical control-variate sampling (also known as the critical height method) were equally precise in tests using a proxy taper equation that was linear in cross-sectional area versus height.
- Valentine, Harry T.; Gregoire, Timothy G.; Furnival, George M. 1992. **Estimation of the aggregate bole volume of a population of trees by stratified, two-stage, probability sampling.** The Statistician. 41: 499-507. A population of tree boles is divided into two strata with regard to height: (1) from stump height to crown height and (2) from crown height to either merchantable height or total

height. The aggregate volume of the bole segments in each stratum is estimated by a two-stage procedure. In a first stage, bole segments are selected at random from a stratum by list sampling with probability proportional to size. In the second stage, the volumes of the bole segments are estimated with either importance sampling or control-variate sampling. In a trial with 316 tuliptrees, the second-stage method was importance sampling in the lower stratum and control-variate sampling in the crown stratum. This stratified method was compared to, and found more efficient than, the non-stratified two-stage method of Gregoire et al. (1986, Canadian Journal of Forest Research, 16, pp. 554-557) which uses importance sampling in the second stage. However, if control-variate sampling replaces importance sampling in the second stage, then the non-stratified method approaches the efficiency of the stratified method. The stratified method seems to be a good choice whenever control of the number of upper stem measurements is essential or desirable, or whenever different instruments are used to take measurements above or below the base of the crown.

Vander Stoep, Gail A., ed. 1992. **Proceedings of the 1991 northeastern recreation research symposium**; 1991 April 7-9; Saratoga Springs, NY. Gen. Tech. Rep. NE-160. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 234 p.

Contains 48 research and management papers on the following subjects: social science in resource management; outdoor recreation planning and management; fisheries and wildlife management; specialization theory; travel, tourism, and community development; urban recreation; and geographic information systems.

Varley, D. A.; Podila, G. K.; Hiremath, S. T. 1992. **Cutinase gene expression in *Cryphonectria parasitica*, the chestnut blight fungus: effect of hypovirulence agents on expression.** In: Abstracts of the international chestnut conference; 1992 July 10-14; Morgantown, WV. [Place of publication unknown]: [Publisher name unknown]: 4.

Varley, D. A.; Podila, G. K.; Hiremath, S. T. 1992. **Cutinase in *Cryphonectria parasitica*, the chestnut blight fungus: suppression of cutinase gene expression in isogenic hypovirulent strains containing double-stranded RNAs.** Molecular and Cellular Biology. 12(10): 4539-4544.

Wade, Gary L.; Chambers, Jeanne C. 1992. Introduction. In: Chambers, Jeanne C.; Wade, Gary L., eds. **Evaluating reclamation success: the ecological consideration--proceedings of a symposium**; 1990 April 23-26; Charleston, WV. Gen. Tech. Rep. NE-164. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 1-2.

Wallner, William. 1992. **Comparison of North American gypsy moth (NAGM) and Asian gypsy moth (AGM).** Gypsy Moth News. 28: 3. Abstract.

Walters, Russell S. 1992. **Protecting red oak seedlings with tree shelters.** Journal of the Pennsylvania Academy of Science. 65: 203. Abstract.

Wang, Y. S.; Miller, D. R.; Welles, J. M.; Heisler, G. M. 1992. **Spatial variability of canopy foliage in an oak forest estimated with fisheye sensors.** Forest Science. 38(4): 854-865.

Wang, Y. S.; Miller, D. R.; Yendol, W. G.; McManus, M. L. 1992. **Application of a Lagrangian stochastic model to aerial spray transport in an oak forest.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 54. Abstract.

Wargo, Philip M.; Kile, Glen A. 1992. **Armillaria root disease.** In: Mukhopadhyay, A. N.; Kumar, J.; Singh, U. S.; Chaube, H. S., eds. Plant diseases of international importance: diseases of sugar, forest, and plantation crops, vol. 4. Englewood Cliffs, NJ: Prentice Hall: 311-345.

Discusses *Armillaria* species and their identification, disease development and symptoms, fungal spread, damage, and control.

Wargo, Philip M.; Onsando, James M. 1992. **Armillaria root disease in tea plantations in Kenya.** Phytopathology. 82(10): 1151. Abstract.

Webb, Ralph E.; Shapiro, Martin; Podgwaite, John D.; Lynn, Dwight E.; Dougherty, Edward M.; Ridgway, Richard L.; Venables, Lee; Cohen, Dave L. 1992. **Field comparison of doses and strains of gypsy moth nuclear polyhedrosis virus against gypsy moth in western Maryland in 1990.** In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1991; 1991 January 14-17; Annapolis, MD. Gen. Tech. Rep. NE-167. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 52. Abstract.

Welsh, Christopher J. E.; Healy, William M.; DeGraaf, Richard M. 1992. **Cavity-nesting bird abundance in thinned versus unthinned Massachusetts oak stands.** Northern Journal of Applied Forestry. 9(1): 6-9. Cavity-nesting birds provide significant benefits to forest communities, but timber management techniques may negatively affect cavity-nesting species by reducing the availability of suitable nest and foraging sites. Cavity-nesting birds from transects in eight Massachusetts oak stands were surveyed to examine the effect of thinning with retention of snag and wildlife trees on bird use of these stands. There was no difference in the number of primary- and secondary-cavity nesters detected per kilometer among thinned and unthinned stands when snag and wildlife trees were retained during thinning.

Werren, J. H.; Raupp, M. J.; Sadoff, C. S.; Odell, T. M. 1992. **Host plants used by gypsy moths affect survival and development of the parasitoid *Cotesia melanoscela*.** Environmental Entomology. 21(1): 173-177.

The effects of short-term phenological changes in different tree species on development and survival of the gypsy moth parasitoid *Costesia melanoscela* were examined. Larvae stung by *C. melanoscela* and an unstung control group were allowed to develop on foliage from four tree species (red maple, mockernut hickory, American beech and white oak). Survival of *Costesia* larvae declined significantly with start date on all four species. Stung larvae suffered significantly higher mortality from causes other than wasp emergence than control larvae.

West, Cynthia D. 1992. **Global trade patterns for furniture products**. In: FPRS 46th annual meeting: biographies & abstracts; 1992 June 21-24; Charleston, SC. Madison, WI: Forest Products Research Society: 62. Abstract.

West, Cynthia D. 1992. **Competitive analysis of the global trade in hardwood chips**. In: Welker, John C., comp. Proceedings of the 1992 southern forest economics workshop on the economics of southern forest productivity: competing in world markets; 1992 April 29-May 1; Mobile, AL. [Place of publication unknown]: [Publisher name unknown]: 27-41.

Reports details of U.S. hardwood chip export statistics and trends, Asian imports of hardwood chips, competitive sources and trends in hardwood fiber supply, and paper production and utilization in Asia, with a focus on Japan.

West, Cynthia D.; Sinclair, Steven A. 1992. **A measure of innovativeness for a sample of firms in the wood household furniture industry**. *Forest Science*. 38(3): 509-524.

Firms in the wood household furniture industry were segmented, based on their adoption of 13 processing technologies, into an innovator group and a noninnovator group. Innovators differed significantly from noninnovators in firm size, technological expertise, technological progressiveness, opinion leadership, information sources, and cosmopolitanism of the decisionmaking group.

Wharton, Eric H.; Kayse, Stephen C.; Nevel, Robert L., Jr. 1992. **The timber industries of Kentucky, 1989**. *Resour. Bull. NE-120*. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 37 p.

A statistical report based on a survey of primary wood manufacturers using wood from Kentucky. Contains statistics on production and consumption of industrial forest products by species, geographic unit, and state, and on production and disposition of manufacturing residues.

Widmann, Richard H. 1992. **Pulpwood production in the Northeast—1990**. *Resour. Bull. NE-123*. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 27 p.

Contains 1990 information compiled from a canvass of all pulp mills that use pulpwood produced in the 14 Northeastern States. Contains data on pulpwood production and consumption from roundwood by county and species group, and on pulpwood chip production from manufacturing residues by state.

Widmann, Richard H.; Gansner, David A.; Arner, Stanford L.; Alerich, Carol L.; Quimby, John W. 1992. **Impact of gypsy moth on oak in Pennsylvania District 7**. In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 56. Abstract.

Widmann, Richard H.; Gansner, David A.; Arner, Stanford L.; Alerich, Carol L.; Quimby, John W. 1992. **Impact of gypsy moth on oak timber supplies in Pennsylvania District 7**. In: Proceedings of the national gypsy moth review; 1991 November 4-7; Raleigh, NC. Raleigh, NC: National Gypsy Moth Management Board: 93-97.

Data collected on 62 remeasured plots provide a preliminary indication of the effect of the gypsy moth in District 7 since 1978.

Widmann, Richard H.; Hackett, Ronald L. 1992. **Downturn seen in 1990 pulpwood production**. *Northern Logger*. 40(10): 20-21.

Pulpwood production in the Northern States fell slightly in 1990. This downturn came after 4 consecutive years of increases. Considering the weak prices for paper and uncertainty in the economy, pulpwood production held up surprisingly well.

Widmann, Richard H.; Long, Michael. 1992. **Ohio timber product output—1989**. *Resour. Bull. NE-121*. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 21 p.

Contains 1989 information compiled from a canvass of all primary manufacturers that use roundwood harvested in Ohio. In 1989, 89 million cubic feet of roundwood was harvested in Ohio. Included are 382 million board feet of sawlogs and 361,500 cords of wood used for pulpwood.

Wilder, Joseph W.; Colbert, Jim J.; Sharov, Alexei; Voorhis, Nathan V. 1992. **A differential equation model for gypsy moth population dynamics**. In: Gottschalk, Kurt W.; Twery, Mark J., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1992; 1992 January 13-16; Annapolis, MD. Gen. Tech. Rep. NE-170. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Experiment Station: 57. Abstract.

Witmer, Gary W.; deCalesta, David S. 1992. **The need and difficulty of bringing the Pennsylvania deer herd under control**. In: Curtis, Paul D.; Fargione, Michael J.; Caslick, James E., eds. Proceedings of the 5th eastern wildlife damage control conference; 1991 October 6-9; Ithaca, NY. Ithaca, NY: Cornell Cooperative Extension: 130-137.

Pennsylvania's white-tailed deer herd has increased dramatically in the last several decades despite increased harvests, causing serious losses to agricultural crop production, forest regeneration, and diversity of forest flora and fauna. High deer numbers are associated with an excessive number of vehicle-deer accidents, and are

implicated in the rapid increase in the incidence of Lyme disease in humans. To reduce deer densities, the bag limit of antlerless deer should be increased, land access problems should be resolved, and more appropriate deer management units should be developed.

Yamasaki, Mariko. 1992. **Marine turtles of the Gulf of Maine.** In: Hunter, Malcolm L., Jr.; Albright, John; Arbuckle, Jane. 1992. The amphibians and reptiles of Maine. Bull. 838. Orono, ME: University of Maine, Maine Agricultural Experiment Station: 120-124.

Yang, S.; Tyree, M. T. 1992. **A theoretical model of hydraulic conductivity recovery from embolism with comparison to experimental data on *Acer saccharum*.** Plant, Cell and Environment. 15: 633-643.

A theoretical model of bubble dissolution in xylem conduits of stems was designed using the finite differential method and iterative calculations via computer. The model was based on Fick's, Henry's, and Charles' laws and the capillary equation. The model predicted the tempo of recovery from embolism in small-diameter branches of woody plants with various xylem structures under different xylem water pressures. The model predicted the time required to recover conductivity in any position in the stem.

Zipperer, Wayne C. 1992. **Population growth and forest loss analysis.** In: New York-New Jersey Highlands

regional study. Washington, DC: U.S. Department of Agriculture: 38-43.

Zipperer, Wayne C.; Birch, Thomas W. 1992. **Forest land ownership.** In: New York-New Jersey Highlands regional study. Washington, DC: U.S. Department of Agriculture: 34-37.

Zipperer, Wayne C.; Neville, L. Robert; Stokes, Gerald L. 1992. **Managing urban sprawl at the fringe.** In: Rodbell, Phillip D., ed. Proceedings of the 5th national urban forest conference: alliances for community trees; 1991 November 12-17; Los Angeles, CA. Washington, DC: American Forestry Association: 30-32.

The rapid urbanization of rural landscapes during the 1970's and 1980's created disagreements on how land should be used. To consider all natural resources in planning, a comprehensive approach is needed. The concept of Limits of Acceptable Change is proposed as a planning tool for urban foresters.

Zipperer, Wayne C.; Zipperer, Constance E. 1992. **Vegetation responses to changes in design and management of an urban park.** Landscape and Urban Planning. 22: 1-10.

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