United States
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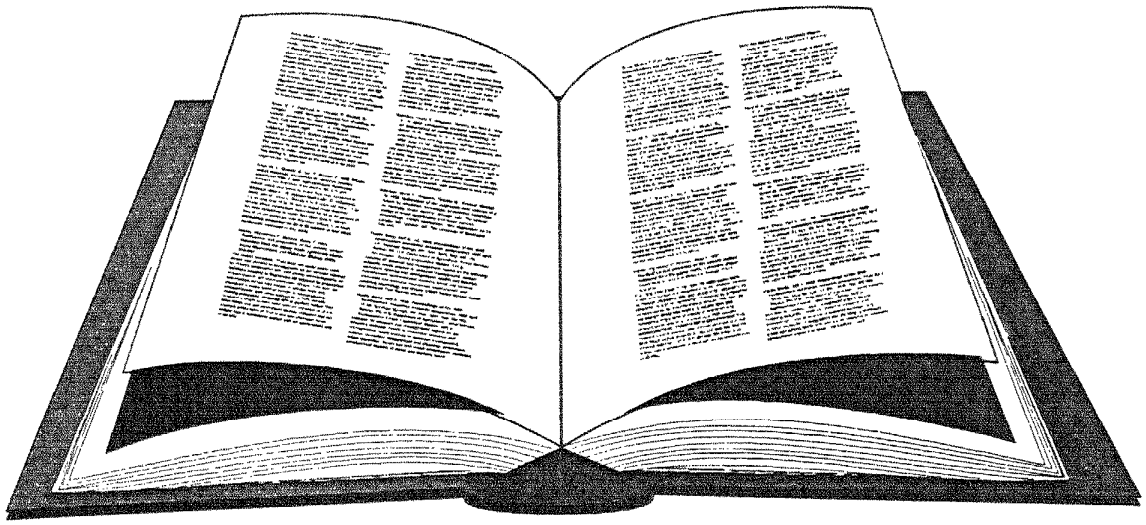
Forest Service

**Northeastern Forest
Experiment Station**

General Technical
Report NE-220

Publications of the Northeastern Forest Experiment Station: 1993 and 1994



Publications—1993

Most Station publications (Research Papers, Research Notes, General Technical Reports, and Resource Bulletins) are available from USDA Forest Service, 359 Main Road, Delaware, OH 43015, Attn: Publications Group. For copies of articles not published by the Station, contact a university library or the Northeastern Forest Experiment Station author or co-author. A list of Station authors by locations follows the citations. Full mailing addresses for headquarters and field locations are shown on the inside back cover.

Aber, John D.; Driscoll, Charles; Federer, C. Anthony; Lathrop, Richard; Lovett, Gary; Melillo, Jerry M.; Steudler, Paul; Vogelmann, James. 1993. **A strategy for the regional analysis of the effects of physical and chemical climate change on biogeochemical cycles in northeastern (U.S.) forests.** Ecological Modeling. 67: 34-47.

A method is presented for extrapolating the results of site-level ecosystem studies to regional scales. Simple, data-intensive models of ecosystem function are combined with regional data planes describing physical and chemical climate to yield regional predictions. The importance of validating regional predictions with rigorous regional measurements is stressed. Examples of available models and validation data sets are presented.

Adams, Edward L. 1993. **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; 1992 November 2-6; Pingtung, Taiwan. [Place of publication unknown]: [Publisher name unknown]: 3-1 - 3-13.

Adams, M. B.; Eagar, C. 1993. **Impacts of acidic deposition on high-elevation spruce-fir forests: results from the Spruce-Fir Research Cooperative.** Pollution Abstracts. 24(3): 143-144. Abstract.

Adams, M. B.; Edwards, P. J.; Wood, F.; Kochenderfer, J. N. 1993. **Artificial watershed acidification on the Fernow Experimental Forest, USA.** Journal of Hydrology. 150: 505-519.

A whole-watershed manipulation project was begun on the Fernow Experimental Forest to study the effects of acidic deposition on forest ecosystems. Two treatment watersheds and one control watershed were included. Treatments were twice ambient N and S deposition; NH_4SO_4 fertilizer was applied 3 times per year. Stream water pH and conductivity were not significantly affected by elevated N and S inputs on either treatment watershed. On one watershed there were no significant treatment effects on stream exports of Ca, SO_4, or NO_3. On another, stream export of NO_3 and Ca have increased due to acidification treatments.

Adams, Mary Beth. 1993. **Movement of sediment and nutrients through riparian areas.** In: Proceedings, technical workshop on sediments; 1992 February 3-7; Corvallis, OR. Washington, DC: Terrene Institute: 41-44.

Reviews the literature examining the role of riparian vegetation in moderating the movement of sediment and nutrients into aquatic ecosystems, particularly in the Eastern United States, and identifies research needs.

Alerich, Carol L. 1993. **Forest statistics for Pennsylvania—1978 and 1989.** Resour. Bull. NE-126. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 244 p.

A statistical report on the fourth forest survey of Pennsylvania (1988-90). Findings are displayed in 157 tables containing estimates of forest area, numbers of trees, wildlife habitat, tree biomass, timber volume, timber products output, growth, and change. Data are presented at three levels: state, geographic unit, and county.

Allen, J. C.; Foltz, J. L.; Dixon, W. N.; Liebhold, A. M.; Colbert, J. J.; Regniere, J.; Gray, D. R.; Wilder, J. W.; Christie, I. 1993. **Will the gypsy moth become a pest in Florida?** Florida Entomologist. 76(1): 102-113.

Considers the questions of invasion, establishment, and subsequent pest status of the gypsy moth in Florida. Invasion is occurring by "hitchhiking" egg masses and other life stages arriving in Florida from northern states where the gypsy moth is established. Another likely mode of invasion is the gradual diffusive spread of the established area which is moving south at 10 to 20 kilometers per year. It is predicted that this spreading front will arrive in north Florida around 2025.

Anderson, R. Bruce; Thomas, R. Edward; Gatchell, Charles J.; Bennett, Neal D. 1993. **Computerized technique for recording board defect data.** Res. Pap. NE-671. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 17 p.

A computerized technique for recording board defect data has been developed that is faster and more accurate than manual techniques. The lumber data base generated by this technique is a necessary input to simulation models that estimate potential cutting yields from various lumber breakdown sequences. The technique allows collection of detailed information on the location and type of defects.

Angradi, Ted R.; Kubly, Dennis M. 1993. **Effects of atmospheric exposure on chlorophyll a, biomass and productivity of the epilithon of a tailwater river.** Regulated Rivers: Research and Management. 8: 345-358.

Armstrong, James P.; Ponzurick, Thomas G.; Luppold, William G. 1993. **Criteria affecting purchases of U.S. hardwood lumber by various Canadian market segments.** In: FPS 47th annual meeting: biographies & abstracts; 1993 June 20-23; Clearwater Beach, FL. Madison, WI: Forest Products Society: 54. Abstract.

Armstrong, James P.; Ponzurick, Thomas G.; Luppold, William G. 1993. **Market-related criteria affecting the purchase of U.S. hardwood lumber by Canadian importers.** Forest Products Journal. 43(6): 13-18.

Armstrong, James P.; Ponzurick, Thomas G.; Luppold, William G. 1993. **A new look at the Canadian market for U.S. hardwood lumber.** Northern Journal of Applied Forestry. 10(3): 128-131.

Producers of U.S. hardwoods have aggressively expanded into international markets. This expansion has increased requirements for information on specific international markets. One such export market is Canada. Canadians purchase a variety of U.S. hardwood lumber species, primarily northern red oak, hard maple, and white oak. All grades of U.S. hardwood lumber are purchased; approximately half of the lumber was graded FAS & 1F, and one-third was graded No. 2 Common or below. The U.S. accounted for virtually all of the hardwood lumber imported by Canada in 1990.

Arther, M. A.; Tritton, L. M.; Fahey, T. J. 1993. **Dead bole mass and nutrients remaining 23 years after clear-felling of a northern hardwood forest.** Canadian Journal of Forest Research. 23: 1298-1305.

Dead bole mass and nutrients were measured in a northern hardwood forest watershed at the Hubbard Brook Experimental Forest, New Hampshire, 23 years after all of the trees were felled and left in place. The experimental treatment of this watershed provided a unique opportunity to study large woody decay in a northern hardwood forest ecosystem with a well-documented disturbance history.

Auchmoody, L. R.; Smith, H. Clay. 1993. **Survival of northern red oak acorns after fall burning.** Res. Pap. NE-678. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5 p.

Survival of recently fallen northern red oak acorns after exposure to a cool fall burn was evaluated in northwestern Pennsylvania. Although no acorns were consumed by the fire, some were charred. Between 40 and 49 percent of the acorns in the litter were destroyed. The fire was not hot enough to kill *Curculio* larvae within the acorns. Burned acorns infested with *Curculio* that survived the fire had 20 percent lower germination rates than unburned acorns.

Auchmoody, L. R.; Smith, H. Clay; Walters, Russell S. 1993. **Acorn production in northern red oak stands in northwestern Pennsylvania.** Res. Pap. NE-680. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5 p.

Production of northern red oak acorns was measured in 21 maturing stands on good sites in northwestern Pennsylvania. The number of acorns produced per acre ranged from 7,000 to nearly 273,000. Acorns were produced in all years. In no year was there consistently good acorn production at all areas, nor was there a good crop for more than 2 consecutive years at any location. Freezing temperatures when oaks were in flower was a major factor affecting acorn production on the Allegheny Plateau.

Barger, J. H.; Cannon, W. N., Jr.; Hall, R. W. 1993. **Global climate change and elm leaf beetle performance on 'homestead' elm.** Ohio Journal of Science. 93(2): 13. Abstract.

Barrett, Hope R.; Nodvin, Stephen C. 1993. **Assessment of potential impact of gypsy moths on Great Smoky Mountains National Park.** In: Liebhold, Andrew M.; Barrett, Hope R., eds. Proceedings: spatial analysis and forest pest management; 1992 April 27-30; Mountain Lakes, VA. Gen. Tech. Rep. NE-175. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 73-84.

In assessing the potential impact of gypsy moth on Great Smoky Mountains National Park (GRSM), forests in GRSM were rated for defoliation potential, sensitivity to environmental stress, and tree-mortality potential. Maps of the GRSM vegetation cover, human access, elevation, slope, and aspect were obtained in digital format at 90-meter pixel resolution. These parameters were incorporated into a geographic information system modeling program.

Barrett, Hope R.; Nodvin, Stephen C. 1993. **Using GIS to assess potential impacts of gypsy moth infestations at Great Smoky Mountains NP.** Park Science. 13(2): 26-27.

Bauer, Leah S.; Sapio, Frank J.; McManus, Michael L.; Maddox, Joseph V.; Jeffords, Michael R.; Onstad, David W. 1993. **Interactions of microsporidium and gypsy moth in Michigan field plots.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 22. Abstract.

Baumgras, John E.; Hassler, Curt C.; LeDoux, Chris B. 1993. **Estimating and validating harvesting system production through computer simulation.** Forest Products Journal. 43(11/12): 65-71.

Describes the Ground Based Harvesting System Simulation model, documents the validation of this model, and demonstrates the application of simulation to comparisons of logging crews and wood-utilization alternatives.

Baumgras, John E.; Luppold, William G. 1993. **Relative price trends for hardwood stumpage, sawlogs, and lumber in Ohio.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 381-389.

Examines the change in log, stumpage, and lumber prices over the past 15 years, contrasts changes in different species and grades of hardwood logs, demonstrates how changing log and stumpage prices have reduced sawmill operating margins, forcing these firms to become even more efficient.

Bergdahl, D. R.; Tritton, L. M.; Sendak, P. E.; Tobi, D. R. 1993. **Use of a geographic information system to study the incidence of annual canker on sugar maples.** Phytopathology. 83(12): 1364. Abstract.

Berisford, C. W.; Lanigan, T. J.; Dalusky, M. J.; Montgomery, M. E. 1993. **Effects of southern tree hosts and climate on gypsy moth survival and development.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 23. Abstract.

Birch, T. W.; Gansner, D. A.; McWilliams, W. H. 1993. **Central hardwood forests: recent trends in a robust resource.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 8-16.
Re-inventories of each of four central hardwood states (Kentucky, Ohio, Pennsylvania, and West Virginia) show that forest area is increasing and that stocking reached new highs. Large increases in volume have been recorded for all but the smallest diameter classes. There is more high-quality hardwood sawtimber. The extent to which the resource is needed and used will depend on trends in the tastes and preferences of forest-land owners; technological changes in the production, marketing, and utilization of wood products and their substitutes; economic forces; attitudes of forest-land owners and others toward timber management and cutting; and attractiveness of local business climates.

Birdsey, Richard. 1993. **The Northern Global Change Program.** In: A regional response to global climate change: New England and eastern Canada: Proceedings of a U.S./Canada Symposium; 1993 May 19-21; Portland, ME. [Place of publication unknown]: [Publisher name unknown]: 161-163.

Birdsey, Richard A.; Plantinga, Andrew J.; Heath, Linda S. 1993. **Past and prospective carbon storage in United States forests.** Forest Ecology and Management. 58(1-2): 33-40.
Concern about increasing concentrations of carbon dioxide in the atmosphere and possible adverse global climate changes has generated interest in understanding the role of terrestrial ecosystems in the global carbon cycle. Since 1952, carbon stored on U.S. timberland has increased by 38 percent, consistent with recently reported trends in Europe, and accounts for as much as 21 percent of a hypothesized carbon sink in northern temperate forests. Carbon storage is expected to increase until 2040, but at a slower rate than at present.

Bischoff, David S.; Slavicek, James M. 1993. **Sequence characterization and temporal expression of the *Lymantria dispar* nuclear polyhedrosis virus immediate-early gene IE-I.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 24. Abstract.

Bischoff, David S.; Slavicek, James M. 1993. **Sequence characterization and temporal expression of the *Lymantria dispar* nuclear polyhedrosis virus immediate-early gene IE-I.** In: 26th annual meeting, Program and abstracts, Society for Invertebrate Pathology 26th annual meeting; 1993 August 1-6; Asheville, NC. Newark, NJ: Society for Invertebrate Pathology: 115. Abstract.

Bormann, Bernard T.; Bormann, F. Herbert; Bowden, William B.; Pierce, Robert S.; Hamburg, Steve P.; Wang, Deane; Snyder, Michael C.; Li, C.Y.; Ingersoll, Rick C. 1993. **Rapid N_2 fixation in pines, alder, and locust: evidence from the sandbox ecosystem study.** Ecology. 74(2): 583-598.

Bowers, Diana F.; Valaitis, Algimantas P. 1993. **Purification of the glycoprotein trehalase from *Lymantria dispar* gut.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 25. Abstract.

Brooks, Robert T. 1993. **What do inventory trends mean to wildlife?** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 82-95.
Presents findings of the 1989 Pennsylvania forest survey as it relates to wildlife habitat resources.

Brooks, Robert T.; Kittredge, David B.; Alerich, Carol L. 1993. **Forest resources of southern New England.** Resour. Bull. NE-127. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 71 p.
An analytical report of the third forest inventory of Connecticut, Massachusetts, and Rhode Island. Included is a discussion of forest area, number of trees, timber volume, tree biomass, timber value, wildlife habitat, ownership, management opportunities, and the future of forest resources in southern New England.

Brown, Sandra; Iverson, Louis R.; Prasad, Anantha; Liu, Dawning. 1993. **Geographical distributions of carbon in biomass and soils of tropical Asian forests.** Geocarto International. 8(4): 45-59.
Presents methods and results for producing spatial estimates of carbon densities (carbon per unit area, Mg ha^{-1} [1 Mg = 10^6 g]) and total carbon pools (product of carbon density and area, Pg) in vegetation and soils for tropical Asian forests.

Burns, Denver P. 1993. **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 that was created in 1905. Like all organizations, the Forest Service has accumulated procedures and processes and ingrained patterns of behavior over time. A program of empowering employees and managers to reduce bureaucratic red tape and promote efficiency and effectiveness was tested. Results of that program are described.

Cannon, W. N., Jr.; Barger, J. H.; Hall, R. W. 1993. **Influence of foliar nitrogen and water content of CO_2 fumigated white oak on gypsy moth pupal weight.** Ohio Journal of Science. 93(2): 14. Abstract.

Cannon, William N., Jr. 1993. **Gypsy moth (Lepidoptera: Lymantriidae) consumption and utilization of northern red oak and white oak foliage exposed to simulated acid rain and ozone.** Environmental Entomology. 22(3): 669-673.
Two-year-old seedlings of white oak and red oak were exposed to ozone (O_3) fumigations in four continuously stirred tank reactor chambers in the greenhouse 3 days a week for 6 weeks. Fumigation treatments were charcoal-filtered air (CFA) and CFA + 0.15 ppm O_3. Two simulated rain treatments, pH 4.2 and pH 3.O, of ≈ 1.25 cm were applied once each week. Third instar gypsy moth were allowed to feed on leaf disks from treated seedlings for 24 hours. Leaf area consumed, food assimilated, weight gain, and relative growth rate were examined. Larvae fed white oak foliage consumed more foliage and gained more weight than those fed red oak foliage. Response to the fumigation and rain treatments was different for each oak species.

Cannon, William N., Jr.; Roberts, Bruce R.; Barger, Jack H. 1993. **Growth and physiological response of water-stressed yellow-poplar seedlings exposed to chronic ozone fumigation and ethylenediurea.** Forest Ecology and Management. 61: 61-73.

Carnieri, Celso; Mendoza, Guillermo A.; Luppold, William G. 1993. **Optimal cutting of dimension parts from lumber with a defect: a heuristic solution procedure.** Forest Products Journal. 43(9): 66-72.

Carter, Jane L.; Ravlin, William; Fleischer, Shelby. 1993. **Egg mass sampling plans for gypsy moth management programs.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 30. Abstract.

Castello, J. D.; Bachand, G. D.; Wargo, P. M.; Jacobi, V. 1993. **Tomato mosaic virus of red spruce on Whiteface Mt. in New York.** Phytopathology. 83(12): 1351. Abstract.

Chilcote, Charley A.; Scriber, J. Mark; Montgomery, Michael E. 1993. **An efficient tree-based gypsy moth sampling protocol for predicting defoliation.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 31. Abstract.

Colbert, J. J. 1993. **The gypsy moth life system model: status and future direction.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 32-36. Abstract.

Colbert, Jim J.; Sharov, Alexei A. 1993. **Gypsy moth life system model: a tool for analysis of population dynamics.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 37. Abstract.

Corbett, Edward S.; Lynch, James A. 1993. **Regional nitrate loading: a focus issue.** In: NADP technical committee meeting: abstracts of papers; 1993 November 15-18; Nashville, TN. Fort Collins, CO: National Atmospheric Deposition Program: 16. Abstract.

Costello, Christine. 1993. **Songbird response to group-selection harvest and clearcuts on WMNF.** Partners in Flight. 4(1): 51. Abstract.

Crawford, Hewlette S.; Lautenschlager, R. A.; Stokes, Martin R.; Stone, Timothy L. 1993. **Effects of forest disturbance and soil depths on digestible energy for moose and white-tailed deer.** Res. Pap. NE-682. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 13 p.
Spruce budworm defoliation, clearcutting for salvage, and prescribed burning of clearcut areas on deep and shallow soils influenced deer and moose foraging in eastern Maine spruce-fir forests from 1980 to 1984. Plant biomass, selection by tractable moose and white-tailed deer, and digestible energy for deer and moose were determined for each treatment. Increase in biomass after defoliation was substantial. Deer and moose ate many of the same species, but in different proportions.

Crawford, Hewlette S.; Lautenschlager, R. A.; Stokes, Martin R.; Stone, Timothy L. 1993. **White-tailed deer and moose habitat following budworm defoliation, clearcutting, and burning.** In: Briggs, Russell D.;

Krohn, William B., eds. Nurturing the northeastern forest: Proceedings of a joint meeting of the New England Society of American Foresters and Maine Chapter of the Wildlife Society; 1993 March 3-5; Portland, ME. SAF Publ. 93-05. Misc. Rep. 382. Orono, ME: Maine Agricultural and Forestry Experiment Station: 56. Abstract.

Crews, Jerry Thomas. 1993. **Use of FGD by-product as a liming substitute on an acidic forest soil.** Columbus, OH: The Ohio State University. 154 p. Ph.D. dissertation.

Cunningham, J. C.; Brown, K. W.; Langevin, D.; Grant, G. G.; Robinson, A.; Podgwaite, J. D. 1993. **Preliminary report on the experimental aerial application of virus and *Bacillus thuringiensis* on gypsy moth in Ontario in 1992.** In: Proceedings of the 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 86-93.

Czapowskyj, M. M.; Safford, L. O. 1993. **Site preparation, fertilization, and 10-year yields of hybrid poplar on a clearcut forest site in eastern Maine, USA.** New Forests. 7: 331-344.
Cuttings of two similar hybrid poplar clones were planted on a drum-chopped, chip-harvested clearcut in eastern Maine. The site had never been cleared for agriculture. Treatments were control, lime (L), L nitrogen (N), L phosphorus (P), LNP, and LNP potassium (K) treatments were established. Competing woody vegetation was mowed once a year for the first 3 years on half of the area. Each mowed treatment produced significantly greater hybrid poplar biomass than the corresponding unmowed treatment. After 10 years, the mowed+LNPK treatment attained the greatest total biomass, 45 Mg/ha, while the unmowed control attained the least, 2 Mg/ha.

Daigle, John J., comp. 1993. **Bibliography of Forest Service recreation research: 1983-1992.** Gen. Tech. Rep. NE-180. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 60 p.
Contains citations for more than 900 publications and articles that describe recreation research conducted by USDA Forest Service and cooperating scientists from 1983 through 1992. Indexes by subject and keywords are included.

Dean, D. H.; Chen, W.; Kwak, I. S.; Liebig, B.; Stetson, D. L.; Dubois, N. R. 1993. **Mode of action of *Bacillus thuringiensis* toxins on gypsy moth: receptor binding and channel function.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 40-41. Abstract.

DeCalesta, David. 1993. **Are there too many or too few deer?** Warren [PA] Times Observer. December 30: S-10.

DeGraaf, Richard M.; Angelstam, Per. 1993. **Effects of timber size-class on predation of artificial nests in extensive forest.** Forest Ecology and Management. 61: 127-136.
Depredation on artificial ground and cup nests in even-aged seedling/sapling, pole, and mature stands of continuous northern hardwood forest was studied in the White Mountain National Forest in New Hampshire from May to June 1988. Track-board nests were used to identify predators of ground nests; plain ground nests and cup nests were used to investigate the effects of timber size class on rates of predation. No elevation in nest predation rate was observed in the early stages of growth, nor was predation rate related to stand area.

DeGraaf, Richard M.; Healy, William M. 1993. **The myth of nature's constancy-preservation, protection and ecosystem management.** Transactions of the North American Wildlife and Natural Resources Conference. 58: 17-28.

DeGraaf, Richard M.; Yamasaki, Mariko; Leak, William B. 1993. **Management of New England northern hardwoods spruce-fir, and eastern white pine for neotropical migratory birds.** In: Status and management of neotropical migratory birds. Gen. Tech. Rep. RM-229. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 363-373.

Dennis, Donald F. 1993. **An empirical study of posting private nonindustrial forests.** Wildlife Society Bulletin. 21: 6-10.
Identifies characteristics influencing the posting of nonindustrial private forest lands by analyzing an empirical model that examined the relationship between posting and variables that measure characteristics of the land, owner, and surrounding community. The results are useful for assessing the implications of parcelization and changing characteristics of landowners on posting.

Dennis, Donald F.; Sendak, Paul E. 1993. **Use-value appraisal for Vermont forest land.** Consultant. 38(2): 28-29.

Dubois, N. R.; McLane, W.; Mierzejewski, K.; Reardon, R. C. 1993. **Effect of a commercial formulation of *Bacillus thuringiensis* Foray 48B against late instar stages (III-IV) in a gypsy moth (*Lymantria dispar* L.) infestation.** In: Proceedings of the 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 99-102.

Dubois, Normand R. 1993. **Bt: gypsy moth resistance.** In: Kuharic, Kathryn E., comp. Proceedings, 1993 annual gypsy moth review; 1993 November 1-4; Harrisburg, PA. [Place of publication unknown]: National Gypsy Moth Management Board: 44-46.

Dubois, Normand R. 1993. **New laboratory and field developments in *Bacillus thuringiensis* and host**

susceptibility. In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 43. Abstract.

Dubois, Normand R.; Dean, Donald H. 1993. **Susceptibility of gypsy moth, *Lymantria dispar* L., to CRYIA(A) and CRYIA(C) insecticidal crystal proteins, combined with *Bacillus thuringiensis* spores and other bacterial species isolated from the forest environment.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 44. Abstract.

Dubois, Normand R.; Reardon, Richard C.; Mierzejewski, Karl. 1993. **Field efficacy and deposit analysis of *Bacillus thuringiensis*, Foray 48B, against gypsy moth (Lepidoptera: Lymantriidae).** Journal of Economic Entomology. 86(1): 26-33.

Four aerial treatments of *Bacillus thuringiensis* were evaluated against gypsy moth infestations to determine their field efficacy and foliar deposits. From an initial average density of 2,000 egg masses per ha (EM/ha), populations in the untreated blocks increased to 6,570 EM/ha. At 30 BIU/ha of insecticidal activity applied in 2.3 and in 7.0 liters, populations decreased significantly to 337 EM/ha (95 percent control) and 280 EM/ha (96 percent), respectively. At 60 BIU/4.6 and 90 BIU/7.0 liters/ha, they decreased to 1,175 EM/ha (89 percent) and 50 EM/ha (99 percent). EM density differences between treatments after spray were not significant and all were significantly less than the controls.

Edwards, P.; Kochenderfer, J.; Adams, M. 1993. **Effects of repeated ammonium sulfate applications on soil leachate chemistry on the Fernow Experimental Forest in West Virginia, USA.** In: Rasmussen, L.; Brydges, T.; Mathy, P., eds. Experimental manipulations of biota and biogeochemical cycling in ecosystems—approach—methodologies—findings: proceedings of a symposium; 1992 May 18-20; Copenhagen, Denmark. Ecosystems Res. Rep. 4. Brussels, Belgium: Commission of the European Communities: 122-124.

In 1987, the USDA Forest Service and the U.S. Environmental Protection Agency began a cooperative study to examine the effects of acidification on various ecosystem parameters. Ammonium sulfate fertilizer was applied to a watershed on the Fernow Experimental Forest in the central Appalachians to elevate N and S inputs and induce acidification. Annually, the fertilizer amendments were approximately double ambient N and S loads. The response of soil leachate chemistry to this manipulation is described.

Edwards, Pamela J.; Kochenderfer, James N. 1993. **Artificial watershed acidification on the Fernow Experimental Forest.** In: Proceedings of the West Virginia Academy of Science 1991: papers of the 66th annual session; 1991 April 6; Montgomery, WV. Morgantown, WV: West Virginia Academy of Science: 72-81.

An artificial watershed acidification study was initiated on the Fernow Experimental Forest in December 1987. Acidification was induced by aerially applying ammonium sulfate fertilizer 3 times per year to a 34-ha watershed at an annual rate approximately double ambient nitrogen and sulfur inputs. A second watershed was maintained as a control. Stream water chemistry, principally during storms, and soil leachate chemistry have been monitored intensively to determine if acidification could be induced and to examine biogeochemical factors involved in the acidification process. Substantial information on stream chemistry responses during storms has been compiled, though stream chemistry has not been altered by the treatment.

Edwards, Pamela J.; Wood, Frederica. 1993. **Field and laboratory quality assurance/quality control protocols and accomplishments for the Fernow Experimental Forest watershed acidification study.** Gen. Tech. Rep. NE-177. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 15 p.

Field and laboratory quality assurance/quality control procedures and protocols for a whole-watershed acidification study on the Fernow Experimental Forest are detailed. Accomplishment is quantified for several test criteria, including QA/QC completeness, precision and accuracy, and relative percent differences for duplicates.

Elmes, Gregory A.; Liebhold, Andrew M.; Twery, Mark J. 1993. **Two approaches to landscape characterization of susceptibility to gypsy moth defoliation.** In: Liebhold, Andrew M.; Barrett, Hope R., eds. Proceedings: spatial analysis and forest pest management; 1992 April 27-30; Mountain Lakes, VA. Gen. Tech. Rep. NE-175. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 172-183.

Susceptibility of hardwood forests to defoliation by the gypsy moth is related to components of the landscape. To clarify processes operating at different geographical scales, results from two studies are presented at forest-community and regional scales. First, a model of stand susceptibility is built on the basis of the relationship of species composition to topographic features. Second, a relative frequency model of susceptibility is investigated for Pennsylvania.

Federer, C. A.; Turcotte, D. E.; Smith, C. T. 1993. **The organic fraction—bulk density relationship and the expression of nutrient content in forest soils.** Canadian Journal of Forest Research. 23(6): 1026-1032.

Feicht, David L.; Fosbroke, Sandra L. C.; Twery, Mark J. 1993. **Forest stand conditions after 13 years of gypsy moth infestation.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech.

Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 47. Abstract.

Feicht, David L.; Fosbroke, Sandra L. C.; Twery, Mark J. 1993. **Forest stand conditions after 13 years of gypsy moth infestation.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 130-144.
Of 603 central Pennsylvania plots that were established in 1978 to measure the short-term impact of repeated gypsy moth defoliation, 228 were selected for continued study in 1985. Individual observations of defoliation and tree vigor were continued through 1992. Although two gypsy moth outbreaks occurred across central Pennsylvania from 1978 to 1990, only 22 percent of the plots were defoliated severely for more than 1 year.

Filip, Gregory M.; Colbert, J. J.; Shaw, C. G., III; Hessburg, Paul F.; Hosman, Kevin P. 1993. **Influence of dwarf mistletoe and western spruce budworm on growth and mortality of Douglas-fir in unmanaged stands.** Forest Science. 39(3): 465-477.
Permanent inventory plots in 94 unmanaged stands of primarily Douglas-fir on three national forests in Oregon and Washington were examined for growth suppression caused by dwarf mistletoe and western spruce budworm. Ten-year increments of diameter and basal area were calculated from measurements in 1977-87. Severity of dwarf mistletoe was scored using the six-class system. Severity and duration of defoliation were determined from aerial maps drawn over a 20-year period.

Fisher, S. W.; Lydy, M. J.; Barger, J.; Landrum, P. F. 1993. **Quantitative structure-activity relationships for predicting the toxicity of pesticides in aquatic systems with sediment.** Environmental Toxicology and Chemistry. 12: 1307-1318.
The toxicity of a series of organophosphorus and carbamate insecticides was measured against the midge *Chironomus riparius* in aquatic systems with and without sediment. Five molecular descriptors were used in regression analysis as potential predictors of insecticidal activity.

Forbes, Craig L.; Sinclair, Steven A.; Luppold, William G. 1993. **Wood material use in the U.S. furniture industry: 1990 to 1992.** Forest Products Journal. 43(7/8): 59-65.

Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. 1993. **Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993**; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 127 p.
Contains three invited papers and 81 workshop summaries and abstracts of oral and poster presentations on gypsy moth biology, molecular biology, ecology, impacts, and management.

Gansner, David A.; Arner, Stanford L.; Hershey, Rachel Riemann; King, Susan L. 1993. **Mapping the defoliation potential of gypsy moth.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Layfayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 172-184.
A model that uses forest stand characteristics to estimate the likelihood of gypsy moth defoliation was applied to forest inventory plot data to produce susceptibility ratings showing defoliation potential for counties in Pennsylvania and six adjacent states.

Gansner, David A.; Arner, Stanford L.; Hershey, Rachel Riemann; King, Susan L. 1993. **Susceptibility maps for gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 59. Abstract.

Gansner, David A.; Arner, Stanford L.; Widmann, Richard H.; Alerich, Carol L. 1993. **After two decades of gypsy moth, is there any oak left?** Northern Journal of Applied Forestry. 10(4): 184-186.

Gansner, David A.; Arner, Stanford L.; Widmann, Richard H.; Alerich, Carol L. 1993. **What's up with Penn's oak?** National Woodlands. 16(3): 8-10.
Reviews specific trends in the stocking of oak on land that has remained in forest since the inventory in 1978.

Gansner, David A.; Arner, Stanford L.; Widmann, Richard H.; Alerich, Carol L. 1993. **What's up with Billy Penn's oak?** Allegheny News. 2(3): 13-15.

Gansner, David A.; Arner, Stanford L.; Widmann, Richard H.; Alerich, Carol L. 1993. **What's up with Billy Penn's oak?** Gypsy Moth News 33. Morgantown, WV: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 4-7.

Gansner, David A.; Drake, David A.; Arner, Stanford L.; Hershey, Rachel R.; King, Susan L. 1993. **Defoliation potential of gypsy moth.** Res. Note NE-354. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.
A model that maps the defoliation potential of gypsy moth defoliation was applied to recent forest inventory plot data to produce susceptibility ratings and maps for a seven-state area.

Gansner, David A.; Drake, David A.; Arner, Stanford L.; Hershey, Rachel Riemann; King, Susan L. 1993. **Defoliation potential of gypsy moth.** NE-INF-117-93.

Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

Garner, Karen; Slavicek, James M. 1993. **Development of nuclear DNA markers identification of the Asian gypsy moth and European gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 60. Abstract.

Gatchell, Charles J. 1993. **Value recovery from low-grade lumber.** In: Proceedings, 21st annual hardwood symposium of the Hardwood Research Council; 1993 May 24-26; Cashiers, NC. Memphis, TN: Hardwood Research Council: 93-100.

Gang ripping holds high potential for maximum value recovery from low-grade lumber. A crosscut saw should be placed ahead of the gang ripsaw to remove crook and to allow sorting of the better end of hardwood lumber from the worse end.

Gatchell, Charles J.; Wiedenbeck, Janice K.; Walker, Elizabeth S. 1993. **A red oak data bank for computer simulations of secondary processing.** Forest Products Journal. 43(6): 38-42.

An extensive data bank for red oak lumber that is compatible with most secondary manufacturing computer simulator tools is now available. Currently, the data bank contains 10,718 board feet in 1,578 boards. The National Hardwood Lumber Association's Special Kiln Dried Rule was used to grade the boards. The percentage of a board's surface measure contained in clear-face cuttings of required sizes can vary considerably depending on whether the board is graded by a computer or a person. Both computer-generated minimum percentages and human-generated optimum clear-face percentages are included in the data bank.

Gentry, Claude E.; Wade, Gary L.; Davidson, Walter H. 1993. **Effects of tree species on soil development and humus composition in minesoils.** In: Zamora, Benjamin A.; Connolly, Randall E., eds. The challenge of integrating diverse perspectives in reclamation: proceedings of the 10th annual national meeting of the American Society for Surface Mining and Reclamation; 1993 May 16-19; Spokane, WA. ASSMR 10-93. Princeton, WV: American Society for Surface Mining and Reclamation: 815-827.

Minesoils in Morris Run, Pennsylvania, were evaluated to determine the effects of tree species on soil development and humus composition. Thirty-six sampling points were established in white pine and red pine (50 to 69 years old) plantations and areas where volunteer black cherry was the dominant species. There were significant differences in the development of litter layers, soil color, horizon development and thickness, accumulation and composition of organic matter (OM), pH, and conductivity. Development of the A1 horizon was the same under all overstory types, but 3 times as many A2 horizons developed under white pine and red pine than under black cherry. More OM accumulated in the A horizon under white pine, and the B horizon of black cherry minesoil had higher OM content than either of the pine soils.

Glass, Ronald J.; More, Thomas A.; Gilbert, Alphonse H. 1993. **Eastern wilderness: extramarket values and public preferences for management.** In: Vander Stoep, Gail A., ed. Proceedings of the 1992 northeastern recreation research symposium; 1992 April 5-7; Saratoga Springs, NY. Gen. Tech. Rep. NE-176. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 131-135.

Eastern wilderness is a valuable resource for both wilderness users and nonusers. Contingent valuation techniques were used to examine the attitudes and values of the public regarding eastern wilderness in Vermont.

Godwin, Marc Layne; Wood, Frederica; Adams, Mary Beth; Eye, Maxine C., comps. 1993. **Annotated bibliography of research related to the Fernow Experimental Forest.** Gen. Tech. Rep. NE-174. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 131 p.

Contains citations for more than 500 publications, videos, and audiovisual programs that describe research on or related to the Fernow Experimental Forest in West Virginia conducted from 1949 through 1991. A subject index and an index of publications by year are provided.

Gottschalk, Kurt W. 1993. **Oak silviculture, management, and defoliation effects in France and Germany.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 23-45.

A study tour of four areas of France and Germany (two in each country) was conducted to examine oak silvicultural and managerial practices and the influence of insect defoliators on the ecology and management of oak forests. The French and German situations may provide useful information for managing oak forests and gypsy moth in the United States, especially the central hardwood region.

Gottschalk, Kurt W. 1993. **Shade, leaf growth and crown development of *Quercus rubra*, *Quercus velutina*, *Prunus serotina* and *Acer rubrum* seedlings.** Tree Physiology. 14: 735-749.

Gottschalk, Kurt W. 1993. **Silvicultural guidelines for forest stands threatened by the gypsy moth.** Gen. Tech. Rep. NE-171. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 49 p.

Ecological and silvicultural information on the interaction of gypsy moth and its host forest types is incorporated into silvicultural guidelines for minimizing the impacts of gypsy moth on forest stands threatened by the insect. Decision charts are used to match stand and insect conditions to the proper prescription.

Gottschalk, Kurt W.; Feicht, David L.; Colbert, J. J. 1993. **Central Pennsylvania tree mortality risks revisited.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 61. Abstract.

Gottschalk, Kurt W.; MacFarlane, W. Russ. 1993. **Photographic guide to crown condition of oaks: use for gypsy moth silviculture treatments.** Gen. Tech. Rep. NE-168. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 8 p.

Includes color photographs as guides for assessing the crown condition of oaks. Applications in vulnerability rating and silvicultural treatments to minimize gypsy moth impacts are presented.

Gove, Jeffrey H. 1993. **Geostatistical modeling of tree crown shapes.** In: Rennolls, Keith, ed. Proceedings of IUFRO S4.11 international conference on stochastic spatial models in forestry; 1993 May 18-21; Thessaloniki, Greece. Thessaloniki, Greece: Aristotle University of Thessaloniki: 7-17.

Gregoire, T. G.; Valentine, H. T.; Furnival, G. M. 1993. **Estimation of bole surface area and bark volume with Monte Carlo methods.** Biometrics. 49: 653-660.

Many attributes of forest trees can be regarded as integrals of some continuous-dimensional characteristic. As a result, their estimation is amenable to variance reduction sampling strategies. In estimating tree characteristics, these methods provide alternatives to the usual estimation by a fitted regression, and also provide flexibility for estimating the integral between any two heights on the tree bole. The application of these methods to the estimation of bole surface area and bark volume is explained, and practical aspects of implementation are discussed.

Gregoire, Timothy G.; Valentine, Harry T.; Furnival, George M. 1993. **Two-stage and three-stage sampling strategies to estimate aggregate bole volume in the forest.** Res. Pap. 444. Helsinki, Finland: Finnish Forest Research Institute: 201-211.

Two-stage sampling strategies are presented that consist of horizontal point sampling at stage one followed by a second stage of sampling with replacement conducted separately at each point from a list of accumulated heights. Analogous strategies that are appropriate when the first stage of sampling consists of fixed-area plots also are presented. The third stage consists of importance sampling or control-variate sampling of individual tree stems. This obviates the need to rely on tree volume/biomass equations to determine the stem volume or biomass of selected trees. For all two-stage and three-stage strategies, the design-based bias and variance of alternative probability-weighted estimators are derived.

Griffith, Douglas M.; DiGiovanni, Dawn; Witzel, Teresa L.; Wharton, Eric H. 1993. **Forest statistics for Ohio, 1991.** Resour. Bull. NE-128. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 169 p.

Describes the fourth forest inventory of Ohio conducted in 1988-90. Findings are displayed in tables containing estimates of forest area, number of trees, sawtimber volume, growing-stock volume, biomass, growth, and removals. Data are presented at state, geographic unit, and county levels.

Hackett, Ronald L.; Widmann, Richard H. 1993. **Pulpwood production bounces back in Northeast and Lake States in 1991.** Northern Logger. 41(11): 14-15.

Hain, F. P.; Cook, S. P.; Hastings, F. L.; Smith, H. R. 1993. **Predation of gypsy moth pupae near the southern leading edge.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 64. Abstract.

Hand, Samuel B.; Manning, Robert; Searls, Paul; Sendak, Paul. 1993. **Seeking consensus—an Aiken solution.** In: Sustaining ecosystems, economies, and a way of life in the northern forest; 1992 November 12-13; Burlington, VT. Burlington, VT: The Wilderness Society: 139-143.

Hansen, Bruce G. 1993. **U.S. exports to Europe and Asia show mixed performance.** Import/Export Wood Purchasing News. 20(2): 1, 18.

Hansen, Bruce G.; Palmer, A. Jeff. 1993. **JEFFI: a simplified, Lotus-based cash flow analysis program.** Gen. Tech. Rep. NE-178. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.

Describes a Lotus-based cash-flow analysis program designed to provide a simple assessment of investments in manufacturing facilities. JEFFI generates discounted and nondiscounted measures of investment performance for an overall project, provides information on equity contributions, and generates statistics on debt repayment.

Hayes-Plazolles, Nancy; Slavicek, James M. 1993. **Rapid accumulation of few polyhedra mutants (FP) during serial passage of *Lymantria dispar* nuclear polyhedrosis virus in *L. dispar* 652Y cells.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 67. Abstract.

Heath, Linda S.; Birdsey, Richard A. 1993. **Carbon trends of productive temperate forests of the coterminous United States.** Water, Air and Soil Pollution. 70: 279-293.

Carbon trends of U.S. timberlands reflect past and current harvesting patterns and forest growth. Using periodic forest

inventory data coupled with the Carbon Budget Model, carbon inventory from 1952 to the present is estimated, and trends through 2070 are projected. Two sets of projections are presented: one is based on economically derived harvest levels and the other assumes no harvests after 1990.

Heath, Linda S.; Birdsey, Richard A. 1993. **Impacts of alternative forest management policies on carbon sequestration on U.S. timberlands.** World Resource Review. 5(2): 171-179.
The amount of carbon stored on U.S. timberlands by vegetation is affected by national policies that influence forest management. The effect of various policies on carbon storage was estimated using the Carbon Budget Model, which was linked with econometric models of the forest sector. The model estimates and projects carbon inventory and harvests in all components of timberlands in the United States and partitions the amount of carbon harvested into different end-use categories. Five scenarios are investigated, a base scenario that projects future carbon under current conditions, two tree planting programs, and two scenarios that feature increased recycling. Projections over a 50-year period illustrate that increased recycling may be as beneficial as storing carbon.

Heath, Linda S.; Kauppi, Pekka E.; Burschel, Peter; Gregor, Heinz-Detlev; Guderian, Robert; Kohlmaier, Gundolf H.; Lorenz, Susanne; Overdieck, Dieter; Scholz, Florian; Thomasius, Harald; Weber, Michael. 1993. **Contribution of temperate forests to the world's carbon budget.** Water, Air and Soil Pollution. 70: 55-69.
Temperate forests currently cover about 600 million ha, about half of their potential. Almost all of these forests have been directly impacted by humans. The total living biomass in trees (including roots) contains an estimated 33.7 Gt C. The estimated total C pool for the entire forest biome is 98.8 Gt. The estimated current net sink flux of biomass is 205 Mt yr^{-1}, with a similar amount removed in harvests for manufacture into various products. The major cause of this C sink is forest regrowth.

Herman, David A.; Valentine, Harry T. 1993. **FORTRAN subroutines for screen entry and editing.** Northern Journal of Applied Forestry. 10(3): 137-139.

Hicks, Ray R., Jr.; Fultineer, Robert M.; Ware, Barbara S.; Gottschalk, Kurt W. 1993. **Susceptibility of oak regeneration in clearcuts to defoliation by gypsy moth.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 145-155.
In 1991 and 1992, gypsy moth defoliation of oak regeneration was observed in clearcuts of varying sizes and ages. Plots were established in surrounding mature forests to document ambient population levels, and subplots were established within the clearcuts to examine the effect of location relative to the clearcut edge. Levels of defoliation on oak regeneration in the clearcuts closely approximated those of the adjacent mature forests. Clearcut age had little effect on defoliation rate, but clearcuts larger than 25 acres had somewhat lower average defoliation, particularly in the subplots near the center.

Hiremath, Shiv; Lehtoma, Kirsten; Nagarajan, Maha. 1993. **Isolation and characterization of gene encoding large subunit of vitellogenin from the gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 70. Abstract.

Hohn, Michael E.; Liebhold, Andrew M.; Gribko, Linda S. 1993. **Geostatistical model for forecasting spatial dynamics of defoliation caused by the gypsy moth (Lepidoptera: Lymantriidae).** Environmental Entomology. 22(5): 1066-1075.

Hollenhorst, Steven J.; Brock, Samuel M.; Freimund, Wayne A.; Twery, Mark J. 1993. **Predicting the effects of gypsy moth on near-view aesthetic preferences and recreation appeal.** Forest Science. 39(1): 28-40.
Using the Scenic Beauty Estimation approach, near-view color photographs were taken of 25 forested sites in the Central Appalachian Plateau with gypsy moth-induced tree mortality ranging from 6 to 98 percent. The slides were arranged randomly and presented to 400 subjects who rated the slides on a 10-point preference scale. Attitudes concerning forest management did not influence visual quality and recreation appeal. The final regression model explained 68 percent of the variance in visual quality. Tree mortality was an outstanding predictor, with linear and quadratic functions of tree mortality best describing the variability in ratings.

Hollinger, D. Y.; Maclaren, J. P.; Beets, P. N.; Turland, J. 1993. **Carbon sequestration by New Zealand's plantation forests.** New Zealand Journal of Forestry Science. 23(2): 194-208.
Describes a method for calculating the carbon uptake and storage of the entire plantation forest estate of New Zealand, and analyzes the sensitivity of calculations to the assumptions made. Results show that per hectare, the average carbon uptake of the New Zealand plantation estate is high compared with estimates from other parts of the world.

Hornbeck, J. W.; Adams, M. B.; Corbett, E. S.; Verry, E. S.; Lynch, J. A. 1993. **Long-term impacts of forest treatments on water yield: a summary for northeastern USA.** Journal of Hydrology. 150: 323-344.
Long-term changes in annual water yield are summarized and compared for 11 catchment studies in the Northeastern United States. Substantial increases in water yield of up to 350 mm per year were obtained in the first year by clearing forest vegetation and controlling regrowth with herbicides. Commercial clearcutting with natural regrowth resulted in initial increases in water yield of 110 to 250 mm per year. This range in response was due to differences in

precipitation and configuration of cuttings. Unless regrowth was controlled with herbicides, yield increases declined quickly after cutting, seldom persisting for more than 10 years. However, yield increases were extended over 20 years or more with intermediate cuttings and/or repeated control of regrowth with herbicides.

Hornbeck, James W. 1993. **Managing New England forests for water: current issues and concerns.** In: Nurturing the northeastern forest: proceedings of a joint meeting of the New England Society of American Foresters and Maine Chapter of the Wildlife Society. CFRU Inf. Rep. 33; Misc. Rep. 382; SAF Publ. No. 93-05. Orono, ME: University of Maine: 188-194.
A list of goals for protecting and enhancing water quality and quantity is used as a framework to discuss issues and concerns facing forest managers in New England.

Horsley, Stephen B. 1993. **Mechanisms of interference between hay-scented fern and black cherry.** Canadian Journal of Forest Research. 23: 2059-2069.
Hay-scented fern interferes with the establishment of black cherry in the Allegheny hardwood forest of Pennsylvania. In stands where fern cover is dense, black cherry seeds germinate, but seedlings do not become established. Allelopathy was eliminated as the cause of interference in previous work; the present studies evaluated the resources of soil water, soil phosphorus, soil nitrogen and light. The impact of hay-scented fern on the level of each resource, the availability of each resource to black cherry seedlings, and the growth response of black cherry seedlings to changes in resource availability were evaluated. Hay-scented fern had little effect on soil moisture and had no effect on plant availability of soil water. The level of soil phosphorus was not reduced by the presence of hay-scented fern, nor was phosphorus availability to black cherry seedlings less when they grew with fern.

Horsley, Stephen B. 1993. **Role of allelopathy in hay-scented fern interference with black cherry regeneration.** Journal of Chemical Ecology. 19(11): 2737-2755.
Black cherry seedlings survive and grow poorly under dense hay-scented fern ground cover in the understory of partially cut Allegheny hardwood stands. Previous studies showed that there were about 80 percent fewer black cherry seedlings where fern was persent than where it was absent. Alleopathic interference with black cherry seed germination, seedling survival, and growth by hay-scented fern foliage leachates, root washings, and soil transformation products was evaluated. Results show that allelopathy does not play a direct role in the interference of hay-scented fern with the establishment of black cherry seedlings in partially cut Allegheny hardwood stands.

Horsley, Stephen B.; Gottschalk, Kurt W. 1993. **Leaf area and net photosynthesis during development of *Prunus serotina* seedlings.** Tree Physiology. 12: 55-69.
The plastochron index was used to study the relationship among plant age, leaf age and development, and net photosynthesis of black cherry seedlings. Leaf area and net photosynthesis were measured on leaves (larger than 75 mm) of plants ranging in age from 7 to 20 plastochrons. Effects of plant developmental stage on leaf area and net photosynthesis were evaluated for leaves of different age (horizontal series), leaves on plants of constant age (vertical series), and leaves of constant age (oblique series). Regression techniques were used to estimate leaf area from leaf-blade dimensions.

Houston, David R. 1993. **Recognizing and managing sapstreak disease of sugar maple.** Res. Pap. NE-675. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.
Sapstreak disease, a potentially serious problem of sugarbushes and forest stands, occurs when the causal fungus *Ceratocystis virescens* invades the sapwood of roots and bases of stems through wounds inflicted during logging, saphauling, or other activities. Methods for recognizing the disease, factors that affect its occurrence and development, and management approaches for reducing the effects of sapstreak disease are discussed.

Houston, David R. 1993. **Temporal spatial shifts within the *Nectria* pathogen complex associated with beech bark disease of *Fagus grandifolia*.** In: 6th international congress of plant pathology; 1993 July 28-August 6; Montreal, PQ. [Place of publication unknown]: International Congress of Plant Pathology: 121. Abstract.

Hsieh, Paul A.; Shapiro, Allen M.; Barton, Christopher C.; Haeni, F. Peter; Johnson, Carole D.; Martin, C. Wayne. 1993. **Methods of characterizing fluid movement and chemical transport in fractured rock.** In: Field trip guidebook for the northeastern United States: 1993 Boston GSA, Volume 2. Contribution 67. Amherst, MA: University of Massachusetts, Department of Geology and Geography: R-1 - R-30.

Huyler, Neil K.; Turner, Terry L. 1993. **Quality wood from underutilized trees.** Journal of Applied Forestry. 10(2): 95-97.

Huyler, Neil K.; Williams, Sumner. 1993. **Maple syrup production cost update for 1992.** Maple Syrup Digest. 5A(3): 34-36.

Iverson, Louis R.; Brown, Sandra; Grainger, Alan; Prasad, Anantha; Liu, Dawning. 1993. **Carbon sequestration in tropical Asia: an assessment of technically suitable forest lands using geographic information systems analysis.** Climate Research. 3: 23-38.
Tropical forest lands hold the greatest promise for sequestering large quantities of carbon. An analysis was performed to produce a first-order map of the technical suitability of present-day forest lands to sequester additional carbon in the continental part of tropical Asia. A geographic information system approach was used to assess the difference between two indices of potential and actual carbon sequestration of forests on a regional scale. This difference represents the degree to which forest biomass has been reduced (degraded) from its potential maximum caused by the long history of human impacts on the landscape. The difference indicates the relative amount

of new biomass carbon that could be added to particular areas of land if they were protected.

Iverson, Louis R.; Schwartz, Mark. 1993. **Changes in the forests of Illinois.** Illinois Natural History Reports 324. Champaign, IL: Illinois Natural History Survey. 5-6.

Jones, Stephen B.; deCalesta, David; Chunko, Shelby E. 1993. **Whitetails are changing our woodlands.** American Forests. 99(11/12): 20-25; 53-54.

Keena, Melody A. 1993. **The abnormal performance syndrome case.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 13-21.

Kelly, J. M.; Taylor, G. E., Jr.; Edwards, N. T.; Adams, M. B.; Edwards, G. S.; Friend, A. L. 1993. **Growth, physiology, and nutrition of loblolly pine seedlings stressed by ozone and acidic precipitation: a summary of the ropis-south project.** Water, Air and Soil Pollution. 69: 363-391.

Kidd, William E., Jr.; Smith, H. Clay. 1993. **Woodlot management: harvesting and renewing it.** Morgantown, WV: West Virginia University. 20 p.
Discusses "good" stewardship practices in the management of woodlots.

Kielbaso, J.; de Araujo, M.; de Araujo, A.; Cannon, W., Jr. 1993. **Monitoring the growth and development of urban forests in Bowling Green, Ohio and Lincoln, Nebraska.** Washington, DC: American Forestry Association, Forest Policy Center; American Forests National Urban Forest Inventory Project Compilation: 6-12.

Kielbaso, J. James; de Araujo, Michiko N.; de Araujo, Antonio J.; Cannon, William N., Jr. 1993. **Monitoring the growth and development of urban forests in Bowling Green, Ohio and Lincoln, Nebraska.** Washington, DC: American Forestry Association, Forest Policy Center; American Forests National Urban Forestry Inventory. 99 p.

Koch, Jennifer L.; Valaitis, Algimantas P. 1993. **Characterization of the digestive proteases of the gypsy moth larva and the interaction with protease inhibitors.** FASEB Journal. 7(7): A1186. Abstract.

Koch, Jennifer L.; Valaitis Algimantas P. 1993. **Characterization of proteolytic activity in *Lymantria dispar* midgut.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 74. Abstract.

Kohl, Michael; Scott, Charles T.; Zingg, Andreas. 1993. **Evaluation of permanent sample surveys for growth and yield studies.** In: Vanclay, J. K.; Skovsgaard, J. P.; Gertner, G. Z., eds. Growth and yield estimation from successive forest inventories: proceedings from the IUFRO conference; 1993 June 14-17; Copenhagen, Denmark. Forsk. No. 3-1993. Lyngby, Denmark: Danish Forest and Landscape Research Institute: 43-53.
Compares growth and yield study plots with sample plots. As an example Swiss growth and yield plots are compared to survey plots with respect to species distribution, stem form, elevation, and other variables. Continuous Forest Inventory is recommended over the more efficient but more complex Sampling with Partial Replacement design for use in conjunction with growth and yield studies.

Kopp, R. F.; White, E. H.; Abrahamson, L. P.; Nowak, C. A.; Zsuffa, L.; Burns, K. F. 1993. **Willow biomass trials in central New York State.** Biomass and Bioenergy. 5(2): 179-187.

Krider, Hallie M.; Shields, Kathleen S. 1993. **Meiosis in the gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 75. Abstract.

Leak, William B. 1993. **Effects of seedbed and overstory on white ash regeneration: a 34-year record.** Northern Journal of Applied Forestry. 10(4): 187-188.

Leak, William B.; Graber, Raymond E. 1993. **Six-year beechnut production in New Hampshire.** Res. Pap. NE-677. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 6 p.
Beechnut production and losses were studied over a 6-year period in 41 northern hardwood stands ranging in age from 10 to 140 years in the White Mountains of New Hampshire. Beechnut production increased consistently with stand age or d.b.h. of dominant trees and percentage of basal area composed of beech. Losses to insects, rodents, and birds before the seed reached the ground ranged from 24 to 100 percent; insects caused the greatest losses. Good seed years occurred about every third year.

LeDoux, Chris B.; Erickson, Michael D.; Hassler, Curt C. 1993. **Production rates and costs of group-selection harvests with ground-based logging system.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 363-372.
As increased demands are placed on forest land for timber production, wildlife, esthetics, recreation, hunting, fishing, and other uses, owners of woodlots and forest land are looking for different ways to harvest or treat the stands to

accomplish their objectives. The large clearcut harvest blocks that had long been the standard with the forest industry are not always acceptable. The contemporary emphasis is on harvesting trees using partial and tree-selection cuts, thinnings, and group-selection methods.

Lewinsohn, Efraim; Gijzen, Mark; Muzika, Rose Marie; Barton, Keith; Croteau, Rodney. 1993. **Oleoresinosis in grand fir (*Abies grandis*) saplings and mature trees.** Plant Physiology. 101: 1021-1028.
The stem content of diterpene resin acids (rosin) increases dramatically following wounding of grand fir saplings, but the level of monoterpene olefins (turpentine) in the stem decreases following injury, despite a significant increase in monoterpene cyclase (synthase) activity. However, this observation was explained when rapid evaporative losses of the volatile monoterpenes from the wound site were demonstrated by trapping experiments, a finding consistent with a role of turpentine as a solvent for the mobilization and deposition of rosin to seal the injury.

Liebhold, A.; Zhou, G.; Luzader, E.; Gansner, D.; Arner, S.; Gottschalk, K. 1993. **Using forest inventory and analysis plot data to predict gypsy moth damage.** In: Kuharic, Kathryn E., comp. Proceedings, 1993 annual gypsy moth review; 1993 November 1-4; Harrisburg, PA. [Place of publication unknown]: National Gypsy Moth Management Board: 64-70.

Liebhold, Andrew M.; Rossi, Richard E. 1993. **Three public-domain geostatistical software packages.** Bulletin of the Ecological Society of America. 74(4): 340-343.

Liebhold, Andrew M.; Simons, Edward E.; Sior, Alan; Unger, James D. 1993. **Forecasting defoliation caused by the gypsy moth from field measurements.** Environmental Entomology. 22(1): 26-32.
The correlation of various preseason field measurements with subsequent defoliation by the gypsy moth was examined for a series of forest stands in central Pennsylvania. Measurements included preseason egg-mass density, density of old egg masses, fecundity, number of larvae hatching per mass, egg-mass length, and host-tree basal area. Egg density (product of fecundity and egg-mass density) was the best single variable for predicting defoliation. The product of egg-mass density and mean egg-mass length provided predictions of defoliation nearly as well as egg density, reflecting the previously observed linear relationship between egg-mass length and fecundity.

Liebhold, Andrew M.; Rossi, Richard E.; Kemp, William P. 1993. **Geostatistics and geographic information systems in applied insect ecology.** Annual Review of Entomology. 38: 303-327.
Discusses the development of two technologies that have created new opportunities for analyzing spatial patterns in insect populations: geographic information systems and geostatistics.

Liebhold, Andrew; Hohn, Michael E.; Gribko, Linda S. 1993. **Forecasting the spatial dynamics of gypsy moth defoliation using 3-dimensional kriging.** In: Liebhold, Andrew M.; Barrett, Hope R., eds. Proceedings: spatial analysis and forest pest management; 1992 April 27-30; Mountain Lakes, VA. Gen. Tech. Rep. NE-175. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 150-159.
The use of 3-dimensional kriging for forecasting pest outbreaks is illustrated with the prediction of defoliation caused by the gypsy moth. Forecasts are based on the statistical autocorrelation (persistence) of defoliation through space and time. Kriged estimates were expressed as probabilities of detectable defoliation. The procedure usually performed well in predicting the spatial distribution of outbreaks in a given year, though values for a regionwide outbreak generally lagged a year behind actual values.

Liebhold, Andrew; Luzader, Eugene; Halverson, Joel; Elmes, Gregory. 1993. **The spatial dynamics of invasions by exotic forest pests.** In: Liebhold, Andrew M.; Barrett, Hope R., eds. Proceedings: spatial analysis and forest pest management; 1992 April 27-30; Mountain Lakes, VA. Gen. Tech. Rep. NE-175. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 125-132.
Biological invasion occurs when a species becomes established in an area disjunct from its usual range of distribution. Over the last century, biological invasions have greatly increased in North America and many of these new species are damaging forest pests. The invasion phenomenon consists of: 1) establishment—founding population is transported to the new environment; 2) establishment—the founder population becomes established as a permanent, reproducing population or becomes extinct; 3) spread—founder population expands its range into adjoining areas of suitable habitat.

Liebhold, Andrew M.; Barrett, Hope R., eds. 1993. **Proceedings: spatial analysis and forest pest management**; 1992 April 27-30; Mountain Lakes, VA. Gen. Tech. Rep. NE-175. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 186 p.
Includes 20 papers on the application of spatial analysis to forest insect and disease problems presented at a workshop on spatial analysis and forest pest management.

Liebhold, Andrew; Williams, David. 1993. **What can historical data tell about gypsy moth population dynamics?** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 78. Abstract.

Liebhold, Andrew; Elkinton, Joseph; Zhou, Guofa; Gribko, Linda; Boetner, Jeff; Hohn, Michael; Luzader, Eugene. 1993. **Regional prediction of gypsy moth defoliation from counts of egg masses, pupae, and male moths: a geostatistical analysis.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum

1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 77. Abstract.

Liebhold, Andrew M., comp. 1993. **Summary of workshop discussions on the future of spatial analysis and forest pest management.** In: Liebhold, Andrew M.; Barrett, Hope R., eds. Proceedings: spatial analysis and forest pest management; 1992 April 27-30; Mountain Lakes, VA. Gen. Tech. Rep. NE-175. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 184-186.

Long, Robert P.; McClenahen, James R. 1993. **Effects of insect defoliation on growth and stand dynamics in oak forests of northcentral Pennsylvania.** In: Dendrochronology and dendrochemistry in forest health monoriting—a workshop; 1993 June 25; University Park, PA. [Place of publication unknown]: [Publisher name unknown]. Abstract.

Long, Robert P.; McClenahen, James R. 1993. **Insect defoliation effects on radial growth of northern red oak in northcentral Pennsylvania.** Bulletin of the Ecological Society of America. 74(2) (Suppl.): 336. Abstract.

Luo, Y.; Miller, D. R.; McManus, M. L.; Krider, H. M. 1993. **Spray droplet evaporation rates: Bt, Dimilin and water.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 80. Abstract.

Luppold, William G. 1993. **Causes and impacts of hardwood log exports.** In: FPS 47th annual meeting: biographies & abstracts; 1993 June 20-23; Clearwater Beach, FL. Madison, WI: Forest Products Society: 19. Abstract.

Luppold, William G. 1993. **Decade of change in the hardwood industry.** In: Proceedings, 21st annual hardwood symposium of the Hardwood Research Council; 1993 May 24-26; Cashiers, NC. Memphis, TN: Hardwood Research Council: 11-24.
The 1980's was a period of substantial growth in hardwood lumber demand and production. However, while some markets for hardwood lumber grew substantially, others declined. Similarly, prices of hardwood stumpage, logs, and lumber also increased, though not for all species. Changes in hardwood lumber demand, production, price, and the cycle that underlies many of the changes occurring in the hardwood market are examined.

Luppold, William G. 1993. **Real world considerations in assessing market feasibility.** In: FPS 47th annual meeting: biographies & abstracts; 1993 June 20-23; Clearwater Beach, FL. Madison, WI: Forest Products Society: 18. Abstract.

Luppold, William G. 1993. **Why are hardwood lumber prices so high? Will they remain high?** Pallet Enterprise. 13(3): 24, 26.
Discusses changes in hardwood lumber demand and hardwood lumber supply, and addresses future supply and demand.

Luppold, William G.; Dempsey, Gilbert P. 1993. **Analysis of eastern hardwood production shows regional shift.** National Hardwood Magazine. 66(13): 36, 40.
Overall production of eastern hardwood lumber showed little growth between 1986 and 1991. Production increased in the northern region and decreased in the southern region. This change seems directly related to the proportion of the timber volume in the areas made up of select species. Greater domestic and international demand for higher grade lumber of these species and the resulting impact on lumber price seems to be the primary cause of the shift in regional lumber production.

Luppold, William G.; Dempsey, Gilbert P. 1993. **Growth and shifts in eastern hardwood lumber production.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 17-22.
Analysis of trends in the production of eastern U.S. hardwood lumber indicates that total output increased sharply between 1977 and 1991. This increase was much more pronounced in the East's northern tier of states than in the southern tier.

Luppold, William G.; West, Cynthia D. 1993. **Development and use of relational data bases for analyses of regional hardwood timber production and consumption.** In: Talmon, Judy, tech. ed. Policy and forestry: design, evaluation and spillovers: Proceedings of the 1993 southern forest economics workshop; 1993 April 21-23; Durham, NC. Durham, NC: [Publisher name unknown]: 207-213.

Lynch, James A.; Grimm, Jeff W.; Bowersox, Van C.; Corbett, Edward S. 1993. **Trends in atmospheric deposition: a national perspective.** In: NADP technical committee meeting: abstracts of papers; 1993 November 15-18; Nashville, TN. Fort Collins, CO: National Atmospheric Deposition Program: 11. Abstract.

Marquis, David A. 1993. **Silviculture as an alternative in deer management.** In: Donald, Rhonda Lucas, ed. Deer management in an urbanizing region: problems and alternatives to traditional management; 1988 April 13; East Windsor, NJ. Washington, DC: Humane Society of the United States: 38-45.

Marquis, David A.; Twery, Mark J. 1993. **Decision-making for natural regeneration in the northern forest ecosystem.** In: Loftis, David; McGee, Charles E., eds. Oak regeneration: serious problems, practical

recommendations. Symposium proceedings; 1992 September 8-10; Knoxville, TN. Gen. Tech. Rep. SE-84. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 156-171.

Failure to obtain prompt regeneration of desired species after a harvest cut can leave a stand unproductive for many decades, cost excessive amounts to reclaim through artificial means, and severely limit the suitability of the stand for a wide range of forest values. Decisionmaking procedures are described for analyzing stand potential and prescribing regeneration treatments. In the Allegheny region where the system has been used extensively, regeneration has been successful in more than 90 percent of the stands harvested.

Martin, Wayne. 1993. **Hubbard Brook Experimental Forest, New Hampshire.** In: Peale, Marty; Kavanagh, Ross; Taylor, Dale; Slaughter, Charles, eds. Strategies for sustained monitoring in arctic and subarctic national park service units and reserved areas: Proceedings of Chena Hot Springs workshop; 1989 January 24-27; Fairbanks, AK. NPS/AR/NRR-93/20. Anchorage, AK: National Park Service: 27.

Martin, C. Wayne; Hornbeck, James W. 1993. **Erosion, sediment, and turbidity in New England forests.** In: Proceedings, technical workshop on sediments; 1992 February 3-7; Corvallis, OR. Washington, DC: Terrene Institute: 75-80.

Summarizes current knowledge on erosion in New England forests with emphasis on research results from the Hubbard Brook Experimental Forest.

Martinat, P. J.; Jennings, D. T.; Whitmore, R. C. 1993. **Effects of diflubenzuron on the litter spider and orthopteroid community in a central Appalachian forest infested with gypsy moth (Lepidoptera: Lymantriidae).** Environmental Entomology. 22(5): 1003-1008.

Mattson, K. G.; Smith, H. C. 1993. **Detrital organic matter and soil CO_2 efflux in forests regenerating from cutting in West Virginia.** Soil Biology and Biochemistry. 25(9): 1241-1248.

Measures of forest floor, soil organic matter, fine roots, and soil CO_2 efflux on regrowing hardwood forests ranging in age from 6 months to 23 years (cuts) were compared with measures from uncut forests to determine whether organic matter is lost following cutting, and to estimate the period over which loss occurs. Mean organic-matter contents of the forest floor were 35 percent lower on the cuts compared to the controls. The loss of forest floor was rapid during the first 10 years following cutting with minimal change to year 23. There was no overall difference between cuts and controls with respect to organic-matter content of the soil A horizon.

McClenahen, James R.; Long, Robert P. 1993. **Height growth of northern red oak in relation to site and atmospheric deposition in Pennsylvania.** Environmental Pollution. 80: 105-114.

The null hypothesis of no relationship between atmospheric wet sulfate deposition and cumulative height growth of northern red oak was tested. A stem analysis-soil/site modeling approach was used to evaluate the potential association of sulfate deposition with spatial and temporal variation in height growth of red oak.

McCormick, Larry H.; Groninger, John W.; Penrod, Kathy A.; Ristau, Todd E. 1993. **Deer exclusion effects on understory development following partial cutting in a Pennsylvania oak stand.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 418-427.

Forty fenced and unfenced paired plots were established in a central Pennsylvania mixed-oak stand following an improvement shelterwood cut to assess the influence of deer exclusion on the establishment and development of understory vegetation during the first 4 years after cutting. Exclusion of deer increased the abundance and height growth of woody regeneration, which consisted primarily of yellow-birch, red maple, black birch, and black gum. Few oak seedlings were established during the study in fenced or unfenced plots. Deer exclusion affected herbaceous composition and enhanced the abundance of woody vines and shrubs.

McGill, D. W.; Solomon, D. S.; Leak, W. B. 1993. **Simulating two harvesting strategies in mixedwood forest types on spruce-fir habitat with FIBER 3.0.** In: Burkhart, Harold E.; Gregoire, Timothy G.; Smith, James L., eds. Modelling stand response to silvicultural practices: Proceedings, IUFRO S4.01 conference; 1993 September 27-October 1; Blacksburg, VA. Publ. FWS-1-93. Blacksburg, VA: Virginia Polytechnic Institute and State University: 198. Abstract.

McGraw, James B.; Gottschalk, Kurt W. 1993. **Regional, among-population, and within-population genetic variation in red oak foliage quality for gypsy moth larval feeding and growth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 83. Abstract.

McManus, Michael. 1993. **Integrated pest management: a window of opportunity.** Journal of Forestry. 91(9): 35.

McPherson, E. Gregory. 1993. **Evaluating the cost effectiveness of shade trees for demand-side management.** Electricity Journal. 6(9): 57-65.

Proper planning and placement of trees as part of a utility demand-side managment strategy offers a number of benefits to utilities and their customers in certain markets. When all of the benefits—including those not easily

quantified—are counted, trees may be a resource and customer service tool that utilities should consider.

McPherson, E. Gregory. 1993. **Monitoring urban forest health.** Environmental Monitoring and Assessment. 26: 165-174.
Renewed interest in urban forestry has resulted in significant public investment in trees during the past few years, yet comprehensive urban forest monitoring programs are uncommon. Monitoring is an integral component of a program to sustain healthy community forests and long-term flows of net benefits. Volunteer-based monitoring will promote continued public involvement and support in community forestry. To overcome constraints to monitoring in urban environments, programs must be relevant, socially desirable, scientifically credible, and economically feasible. A three-tiered monitoring approach is discussed.

McPherson, E. Gregory; Nowak, David J. 1993. **Value of urban greenspace for air quality improvement: Lincoln Park, Chicago.** Arborist News. 2(6): 30-32.
Daily air pollutant uptake by trees in a 525-acre section of Lincoln Park was estimated for four different pollutants and two scenarios: concentrations at the National Ambient Air Quality Standard (NAAQS) and normal levels. The value of air cleansing was implied using costs of traditional air pollution controls. The annual value of trees in migrating air pollution was approximately $25,000. Assuming the NAAQS scenario, greatest benefits were received from interception of particulates ($355/day) and absorption of sulfur dioxide ($99/day).

McPherson, E. Gregory; Nowak, David J.; Sacamano, Paul L.; Prichard, Scott E.; Makra, Edith M. 1993. **Chicago's evolving urban forest: initial report of the Chicago Urban Forest Climate Project.** Gen. Tech. Rep. NE-169. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 55 p.
Traces the history of Chicago's landscape as it has evolved from a mixture of prairie, wetlands, and oak-hickory forests into a major metropolis. An analysis of 1987 aerial photographs indicates that Chicago-area tree cover has increased from a presettlement level of about 13 percent to nearly 20 percent today. Street trees predominate in Chicago's residential areas, where buildings and paving restrict tree cover in many off-street locations. Larger percentages of tree cover were found for off-street trees in suburban Cook and DuPage Counties.

McPherson, Gregory; Rowntree, Rowan A. 1993. **Energy conservation potential of urban tree planting.** Journal of Arboriculture. 19(6): 321-331.
Monitoring and computer simulation studies indicate that trees can be a cost-effective energy conservation measure for some electric utilities. A single 25-foot-tall tree can reduce annual heating and cooling costs for a typical residence by 8 to 12 percent. Assuming annual savings of $10 per household, a nationwide residential tree-planting program could save about $1 billion each year.

McPherson, E. Gregory; Simpson, James R.; Sacamano, Paul L. 1993. **Impact of urban heat island on cooling and environment: a demonstration project.** Southwest Horticulture. 10(2): 20.
A demonstration project was undertaken to determine the magnitude of landscape-induced changes in microclimate on building cooling loads and water use for four typical residences in Phoenix.

McPherson, E. Gregory; Simpson, James R.; Sacamano, Paul L. 1993. **The impact of vegetation on air conditioning and landscape water use in Phoenix.** American Nurseryman. 178(12): 165-168.
Discusses how landscaping affects the energy and water needs of four typical residences in Phoenix, a city whose average summertime temperatures are nearly 10 degrees warmer today than 40 years ago.

McQuattie, C. J.; Melhuish, J. H.; Wong, B. L. 1993. **Cytological changes in mycorrhizal loblolly pine roots after exposure to lead or zinc at three acidity levels.** In: Allan, R. J.; Nriagu, J. O., comps., eds. International conference: heavy metals in the environment. Vol. 1. Edinburgh, UK: CEP Consultants Ltd: 73-76.
Cytological changes in mycorrhizal roots of loblolly pine seedlings treated four times (once/week) with elevated levels of Pb or Zn at pH 5, 4, or 3 were assessed by electron microscopy. Lead and Zn treatments resulted in loss of cytoplasm in the fungal mantle and increased vacuolation of Hartig net huphae and meristem cells. Dense precipitates (possibly Pb) were seen in mantle and cortical cells at 10 mg/L Pb and in Hartig net and meristem cells at 50 mg/L Pb. Zinc (75 mg/L) induced accumulation of dense material in meristem vacuoles and the endodermis. Deterioration of mycorrhizae intensified as acidity level increased.

McQuattie, C. J.; Schier, George A. 1993. **Effect of ozone and aluminum on pitch pine (*Pinus rigida*) seedlings: needle ultrastructure.** Canadian Journal of Forest Research. 23: 1375-1387.
Newly germinated pitch pine seedlings inoculated with a mycorrhizal fungus were grown for 13 weeks in sand irrigated with nutrient solution (pH 4.0) containing 0, 12.5, 25, or 50 mg/L aluminum in growth chambers fumigated with 0, 50, 100, or 200 ppb ozone. Cytological changes in needles of seedlings stressed by ozone and aluminum, singly and in combination, were determined by light and electron microscopy. Changes in needles exposed to ozone were most pronounced in the outer mesphyll. These were major changes in the stele and inner mesophyll in the presence of aluminum. At lower levels of either ozone or aluminum, the cytoplasm became more densely stained. Accumulation of dense materials appeared at intermediate concentrations. Localized cell collapse and deterioration was evident at high concentrations.

McQuattie, Carolyn J.; Schier, George A. 1993. **Effect of elevated carbon dioxide on changes in growth, cellular structure, and elemental localization in aluminum-treated pitch pine mycorrhizae.** In: Peterson, Larry; Schelkle, Michelle, eds. Abstracts of the 9th North American conference on mycorrhizae; 1993

August 8-12; Guelph, ON. [Place of publication unknown]: [Publisher name unknown]: 121. Abstract.

McQuattie, Carolyn J.; Stephenson, Stephen L.; Edwards, Pamela J. 1993. **Effect of stream acidity on decomposition of sugar maple (*Acer saccharum*) and red oak (*Quercus rubra*) leaves.** Ohio Journal of Science. 93(2): 48. Abstract.

McWilliams, W. H.; Hershey, R. Riemann; Drake, D. A.; Alerich, C. L. 1993. **Characterizing forest composition of the Allegheny Mountains using extensive forest inventory data.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 490. Abstract.

McWilliams, W. H.; Stout, S. L.; Bowersox, T. W.; McCormick, L. H. 1993. **An assessment of advance regeneration and herbaceous communities in Pennsylvania forests.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10, West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service. North Central Forest Experiment Station: 489. Abstract.

McWilliams, William H.; Hershey, Rachel Riemann; Drake, David A.; Alerich, Carol L. 1993. **Characterizing forest composition of the Allegheny Mountains using extensive forest inventory data: an overview.** In: Lund, H. Gyde, ed. Proceedings of a national workshop: integrated ecological and resource inventories; 1993 April 12-16; Phoenix, AZ. WO-WSA-4. Washington, DC: U.S. Department of Agriculture, Forest Service: 113-115.
Describes a pilot study aimed at developing a system that integrates the Northeastern Station's Forest Inventory and Analysis data archive with a recently acquired geographical information system. It is expected that the system will evolve into a useful tool for characterizing species composition, wildlife habitat, recreation potential, and other landscape-level forest attributes. Inter- and intra-community relationships will be investigated and spatial gradients will be emphasized.

McWilliams, William H.; Hershey, Rachel Riemann; Drake, David A.; Alerich, Carol L. 1993. **Characterizing landscape-level forest vegetation: an application for geographic information systems and database management systems using extensive forest inventory data.** In: Kwon, O-Bok, chairman. Advancement in forest inventory and forest management sciences: proceedings of the IUFRO Seoul conference; 1993 September 20-25; Seoul, South Korea. Seoul, South Korea: Forestry Research Institute of the Republic of Korea: 385-396.
The USDA Forest Service's Forest Inventory and Analysis group collects extensive forest inventory data that is a useful source for studies of forest composition and diversity. A pilot study of arboreal composition in the Allegheny Mountains is integrating information stored in a relational data base with spatial information managed by a geographical information system. The results illustrate how simple measures of richness and heterogeneity enhance traditional forest-type naming schemes. Clustering algorithms are being evaluated as a way to better catalog existing tree communities.

McWilliams, William H.; Mills, John R.; Burkman, William G. 1993. **The state of the Nation's forest land.** National Woodlands. 16(2): 8-10, 13.
Summarizes the current knowlegde on past, present, and future directions of forest resources in the United States. Focuses on the impact of the spotted owl, forest health, and wetlands legislation as they relate to public policy on forest biodiversity, recreation, water, wildlife, and timber.

Mierzejewski, Karl; Reardon, Richard; McLane, Winfred; Dubois, Normand; Roland, Timothy; Yendol, William; Onken, Amy. 1993. **Evaluation of three application rates of *Bacillus thuringiensis*: efficacy and deposit analysis.** NA-TP-08-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 15 p.
The objectives of this study were to determine the effect of one dose of Bt applied at three different application rates on preventing defoliation, reducing populations, and maximizing deposit on foliage.

Miller, Gary W. 1993. **Financial aspects of partial cutting practices in central Appalachian hardwoods.** Res. Pap. NE-673. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 9 p.
Uneven-age silviculture can be used to regenerate and manage many eastern hardwood stands. Single-tree selection is feasible in stands where a desirable shade-tolerant commercial species can be regenerated following periodic harvests. A variety of partial cutting practices, including single-tree selection and diameter-limit cutting, have been used for more than 30 years to manage central Appalachian hardwoods on the Fernow Experimental Forest near Parsons, West Virginia. Results from these research areas are presented to help forest managers evaluate financial aspects of partial cutting practices.

Miller, Gary W.; Smith, H. Clay. 1993. **A practical alternative to single-tree selection?** Northern Journal of Applied Forestry. 10(1): 32-38.
When landowners want to develop and maintain an uneven-age tree structure in eastern hardwood stands, single-tree selection often is the only practical, long-term partial regeneration harvest method. This method provides a means for improving quality and controlling stocking of the residual stand necessary for sustained yield of desired products. Diameter-limit cutting is the most common partial regeneration practice used in eastern hardwoods, primarily because it is much easier to apply. But diameter-limit cuts do not control residual stocking or improve the quality of

residual trees. Most objectives of single-tree selection can be attained with flexible diameter-limit harvest guidelines based on potential value increase of individual trees combined with an improvement cut in small sawtimber trees at each periodic cut.

Miller, Gary W.; Sullivan, Jay. 1993. **Formulating a stand-growth model for mathematical programming problems in Appalachian forests.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 353-362.

Although several growth models are available for Appalachian hardwoods, few have been formulated to serve as inputs to such analytical models. Methods for formulating nonlinear growth constraints for two-stage matrix simulator used in certain Appalachian hardwood stands are demonstrated. A generalized growth constraint is presented that can be indexed by size class, species group, and stand for sizable management problems.

Minocha, Rakesh; Kvaalen, Haarald; Minocha, Subhash C.; Long, Stephanie. 1993. **Polyamines in embryogenic cultures of Norway spruce (*Picea abies*) and red spruce (*Picea rubens*).** Tree Physiology. 13: 365-377.

Embryogenic cultures of red Norway spruce were initiated from dissected mature zygotic embryos. The tissues were grown on proliferation medium or maturation medium. On proliferation medium, the embryogenic tissue continued to produce early-stage somatic embryos. On maturation medium, fully mature embryos developed from the embryonic tissue. Both putrescine and spermidine concentrations always were higher in cultures grown on proliferation medium than in cultures grown on maturation medium. In both species, spermidine concentrations declined with time in the tissues grown on maturation medium. Spermine was present in only minute quantities and showed only a small change with time.

Minocha, Rakesh; Shortle, Walter C. 1993. **Fast, safe, and reliable methods for extraction of major inorganic cations from small quantities of woody plant tissues.** Canadian Journal of Forestry Research. 23(8): 1645-1654.

Discusses two simple and fast methods for the extraction of major inorganic cations (Ca, Mg, Mn, K) from small quantities of stemwood and needles of woody plants.

Montgomery, M. E. 1993. **A view from the homeland, Eurasia.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 84. Abstract.

More, Thomas A. 1993. **Review of "The joyless economy: the psychology of human satisfaction".** Journal of Leisure Research. 25(3): 317-318.

More, Thomas A.; Averill, James R. 1993. **Emotion and the experience of recreation: a theory.** In: Abstracts for the 1993 Symposium on leisure research; 1993 October 20-24; San Jose, CA. Arlington, VA: National Recreation and Park Association, Resource Development Division: 75. Abstract.

More, Thomas A.; Glass, Ronald J.; Zwick, Rodney R. 1993. **Fish and wildlife resources allocated through the invisible economy of rural New England.** In: Thompson, Ian D., ed. Forests and wildlife: towards the 21st century: proceedings of the International Union of Game Biologists 21st congress; 1993 August 15-20; Halifax, NS. Chalk River, ON: Canadian Forest Service: 175-180.

Although the subsistence use of fish and wildlife is associated with Third World nations, it may be more widespread than previously thought. The extent of harvesting of natural resources for personal use in a rural area of the northeastern United States is discussed. Results suggest that such harvesting is fairly common and forms the basis for a network of transactions and social obligation that serves as an "invisible economy."

Muzika, R. M. 1993. **Understanding the ecological effects of gypsy moth.** Gypsy Moth News. 32: 7-9.

Muzika, Rose-Marie. 1993. Review of **"Forested wetlands. Ecosystems of the world, volume 15."** Quarterly Review of Biology. 68(1): 130-131.

Muzika, Rose-Marie. 1993. **Terpenes and phenolics in response to nitrogen fertilization: a test of the carbon/nutrient balance hypothesis.** Chemoecology. 4(1): 3-7.

Nitrogen fertilization resulted in a linear increase in the growth of *Abies grandis* seedlings, but a linear decrease in foliage concentrations of phenolic compounds. These data are consistent with the inverse relationship between growth and production of carbon-based secondary chemicals predicted by the carbon/nutrient balance (CNB) hypothesis. However, in contrast to predictions of the CNB hypothesis, nitrogen fertilization had no effect on foliage terpene concentrations.

Northeastern Forest Experiment Station. 1993. **Branching out to the youth of America: Environmental Education Outreach Program.** NE/NA-INF-116-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station and Northeastern Area, State and Private Forestry.

Conveys the need for and importance and success of the Environmental Education Outreach Program.

Neville, L. Robert; Zipperer, Wayne, eds. 1993. **New York-New Jersey Highlands regional study: analysis of selected resources.** NA-TP-04-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 87 p.

Nolley, Jean W. 1993. **Bulletin of hardwood market statistics: fall 1992.** Res. Note NE-352. 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. 1993. **Bulletin of hardwood market statistics: winter 1992.** Res. Note NE-353. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 43 p.

Nolley, Jean W. 1993. **Bulletin of hardwood market statistics: spring 1993.** Res. Note NE-355. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 42 p.

Nolley, Jean W. 1993. **Bulletin of hardwood market statistics: summer 1993.** Res. Note NE-356. Radnor PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 43 p.

Nowak, Christopher A.; Abrahamson, Lawrence P. 1993. **Vegetation management on electric transmission line rights-of-way in New York State: the stability approach to reducing herbicide use.** In: Gjerstad, Dean H., ed. Proceedings, international conference on forest vegetation management: ecology, practice and policy; 1992 April 27-May 1; Auburn, AL. Sch. For. Rep. 1993:1. Auburn, AL: Auburn University: 183-191.
Over the past decade there has been a successful effort by the utilities and regulatory agencies in New York to reduce herbicide use on electric transmission line rights-of-way and maintain safe and reliable transmission of electricity. The key to this success has been the "stability approach" to vegetation management that centers on the selective removal of undesirable vegetation, and concurrent promotion of stable, low-growing, desirable vegetation.

Nowak, D. J.; McPherson, E. G. 1993. **Quantifying the impact of trees: the Chicago Urban Forest Climate Project.** Unasylva. (173) 44(2): 39-44.
Reports on the methodologies and initial results of an urban forestry research project based in Chicago. Discusses the interrelated urban forest ecosystem functions that currently are being studied—climate modification, energy conservation, air quality, and carbon dioxide sequestration—and considers the cost-benefit implications of urban vegetation.

Nowak, David J. 1993. **Atmosphere carbon reduction by urban trees.** Journal of Environmental Management. 37: 207-217.
Because they sequester atmospheric carbon through the growth process and conserve energy in urban trees, trees are one means to combat increasing levels of atmospheric carbon. Analysis of the urban forest in Oakland, California, revealed a carbon-storage level of 11 metric tons per hectare. Trees in the area of the 1991 fire in Oakland stored about 14,500 metric tons of carbon, 10 percent of the total amount stored by Oakland's urban forest. Carbon storage by urban forests nationally is estimated at 350 to 750 million metric tons.

Nowak, David J. 1993. **Compensatory value of an urban forest: an application of the tree-value formula.** Journal of Arboriculture. 19(3): 173-177.
According to the tree-valuation formula of the Council of Tree and Landscape Appraisers, the estimated compensatory value of the urban forest in Oakland, California, is $385.7 million, with residential trees accounting for 58.6 percent of the total value. Tree compensatory values range from $19,800 per acre on institutional lands to $1,400 per acre for trees on lands with transportation uses. The value of trees in the area of the 1991 Oakland fire was about $26.5 million.

Nowak, David J. 1993. **Historical vegetation change in Oakland and its implications for urban forest management.** Journal of Arboriculture. 19(5): 313-319.
Vegetation in Oakland, California, has changed drastically from a preurbanized area with about 2 percent tree cover to 19 percent today. Species composition had been dominated by coast live oak, California bay, and coast redwood. Today, blue gum, Monterey pine, and coast live oak dominate. Many forces have shaped Oakland's urban forest, including the gold rush of the 1840's, the San Francisco earthquake of 1906, massive afforestation of the early 1900's, and various fires from 1923 to 1991.

Nowak, David J.; Sisinni, Susan. 1993. **Plant chemical emissions.** Miniature Roseworld. Spring: 4-6.
Discusses the emission of volatile organic compounds from plant leaves and how these and other attributes of vegetation influence formation of ozone, and reports on chemical emissions into the root environment and their potentially detrimental influence on surrounding plants.

ODell, Carol A. B.; Montgomery, Michael E. 1993. **USDA Forest Service Quarantine Laboratory.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Service Experiment Station: 86. Abstract.

ODell, Thomas M.; Keena, Melody A.; Tanner, John A.; Willis, Raymond B. 1993. **Gypsy moth rearing problem linked to iron (Fe) in diet.** Gypsy Moth News. 32: 3-5.

Onstad, D. W.; Maddox, J. V.; Jeffords, M. R.; McManus, M. L.; Bauer, L. S.; Webb, R. W. **Modelling horizontal transmission of microsporidia in gypsy moth populations.** 1993. In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 87. Abstract.

Ostrofsky, William D.; Shortle, Walter C. 1993. **Current and potential uses of the Shigometer for forest tree health evaluations.** In: Raychaudhuri, S. P.; Teakle, D. S., comps., eds. Management of plant diseases caused

by fastidious prokaryotes. New Delhi, India: Associated Publishing: 59-67.

Pardo, L. H.; Driscoll, C. T. 1993. **A critical review of mass balance methods for calculating critical loads of nitrogen for forested ecosystems.** Environmental Reviews. 1: 145-156.
Reviews four mass-balance methods for calculating critical loads for nitrogen deposition: steady-state water chemistry, nitrogen mass balance, basic cation mass balance, and steady-state mass balance.

Peacock, John W.; Schweitzer, Dale F. 1993. **Results of Bt (Foray 48B) bioassays on non-target Lepidoptera.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 88. Abstract.

Peacock, John W.; Schweitzer, D. F.; Talley, Steven E.; Reardon, R. C.; Wagner, David L. 1993. **Effects of *Bacillus thuringiensis* (Bt) on non-target Lepidoptera.** In: Proceedings of the 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 48-50.

Perkey, Arlyn W.; Wilkins, Brenda L.; Smith, H. Clay. 1993. **Crop tree management in eastern hardwoods.** NA-TP-19-93. Morgantown, WV: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 102 p.

Pierce, Robert S.; Hornbeck, James W.; Martin, C. Wayne; Tritton, Louise M.; Smith, C. Tattersall; Federer, C. Anthony; Yawney, Harry W. 1993. **Whole-tree clearcutting in New England: manager's guide to impacts on soils, streams, and regeneration.** Gen. Tech. Rep. NE-172. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 23 p.
Studies of impacts of whole-tree clearcutting in spruce-fir, northern hardwood, and central hardwood forest types are summarized for use by practicing foresters, land managers, environmental protection agencies and organizations, and the general public. Guidelines are given for protecting soils, stream-water quality, nutrient cycles, and site productivity.

Podgwaite, J. D.; Reardon, R. C.; Webb, R. E; Cunningham, J. C. 1993. **Field evaluations of Gypchek against gypsy moth in Pennsylvania in 1992.** In: Proceedings of the 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 94-97.

Podgwaite, J. D.; Reardon, R. C.; Webb, R. E; Cunningham, J. C. 1993. **Field evaluations of Gypchek formulations.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 90. Abstract.

Podgwaite, John D.; Dubois, Normand R.; Reardon, Richard C.; Witcosky, Jeffrey. 1993. **Retarding outbreak of low-density gypsy moth (Lepidoptera: Lymantriidae) populations with aerial applications of Gypchek and *Bacillus thuringiensis*.** Journal of Economic Entomology. 86(3): 730-734.
Low-denisty gypsy moth populations in Virginia were treated aerially with the nucleopolyhedrosis virus (baculovirus) product Gypchek and with a commercial preparation (SAN 415 SC 32LV) of the NRD-12 strain of Bt. Weekly counts of live larvae under burlap bands were significantly lower in Gypchek- and SAN 415-treated plots than in control plots, but defoliation differences between sprayed and control plots were not significant.

Pogge, Franz L. 1993. **Postmark pursuits.** In: Remembering the Centennial. FS-535 [559]. Washington, DC: U.S. Department of Agriculture, Forest Service: 49-50.

Profous, G.; Rowntree, A. 1993. **Structure and management of the urban forest in Prague.** Unasylva (173). 44(2): 33-38.
Presents results of a study of Prague's urban forests, based on a 16-neighborhood sample, conducted in 1987 and updated in 1990.

Punches, John W.; Bush, Robert J.; Luppold, William G. 1993. **Wood materials use in the U.S. cabinet industry: 1991 to 1993.** In: FPS 47th annual meeting: biographies & abstracts; 1993 June 20-23; Clearwater Beach, FL. Madison, WI: Forest Products Society: 55. Abstract.

Racin, G.; Colbert, J. J.; Sharov, A. A. 1993. **Accessing gypsy moth life system models.** In: Fosbroke, Sandra L.C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 93. Abstract.

Reardon, R. C. 1993. **Introduction and augmentative release of gypsy moth parasites: a historical review (1900-1980).** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 94. Abstract.

Rebbeck, Joanne; Jensen, Keith F.; Greenwood, Michael S. 1993. **Ozone effects on grafted mature and juvenile red spruce: photosynthesis, stomatal conductance, and chlorophyll concentration.** Canadian Journal of Forest Research. 23: 450-456.

Red spruce was grown as grafted mature and juvenile scions in open-top chambers and exposed to charcoal-filtered air and nonfiltered air with ozone additions of 75 or 150 ppb above ambient to determine if tissue age affects the species response to oxidant pollution as measured by photosynthesis, stomatal conductance, and chlorophyll concentration.

Reinhardt, Robert; Weaver, Kelly J.; Bulmer, Susan; Smith, Maja; Echelberger, Herbert E. 1993. **Lake Champlain recreation management program results from the recreation resources inventory, boat study, and recreation user surveys.** In: Vander Stoep, Gail A., ed. Proceedings of the 1993 northeastern recreation research symposium; 1993 April 18-20; Saratoga Springs, NY. Gen. Tech. Rep. NE-185. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 25-35.

Riegel, Christopher I.; Slavicek, James M. 1993. **Characterization of a gene from *Lymantria dispar* nuclear polyhedrosis virus homologous to the *Autographa californica* nuclear polyhedrosis virus ecdysteroid UDP-glucosyl transferase gene.** In: Program and abstracts, Society for Invertebrate Pathology 26th annual meeting; 1993 August 1-6; Asheville, NC. Newark, NJ: Society for Invertebrate Pathology: 114. Abstract.

Riegel, Christopher I.; Slavicek, James M. 1993. **Sequence characterization and temporal expression of the *Lymantria dispar* nuclear polyhedrosis virus ecdysteriod UDP-glucosyl transferase (EGT) gene: generation of an EGT transplacement vector containing a B-galactosidase gene.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 95. Abstract.

Rink, George; Weber, Barbara C.; Baines, D. Michael; Funk, David T. 1993. **Acrobasis shoot moth (Lepidoptera: Pyralidae) infestation-tree height link in a young black walnut plantation.** In: 84th Annual Report, Northern Nut Growers Association; 1993 August 1-4; Pittsburg, KS. [Place of publication unknown]: [Publisher name unknown]: 20-24.

Roesch, Francis A., Jr.; Green, Edwin J.; Scott, Charles T. 1993. **An alternative view of forest sampling.** Survey Methodology. 19(2): 199-204.
A generalized concept is presented for all of the commonly used methods of forest sampling. The forest is viewed as a two-dimensional picture that is cut up like a jigsaw puzzle; the pieces are defined by individual selection probabilities of the trees in the forest. This results in a finite number of independently selected sample units.

Roesch, Francis A., Jr.; Green, Edwin J.; Scott, Charles T. 1993. **A test of alternative estimators for volume at time 1 from remeasured point samples.** Canadian Journal of Forest Research. 23(4): 598-604.
Evaluates two estimators for volume at time 1 for use with permanent horizontal point samples. One estimator uses only the trees sampled at time 1, while the second takes advantage of additional sample information that becomes available at time 2. In this test, the second estimator always was lower in sum of squared differences and sum of absolute differences for board- and cubic-foot volume than the traditional estimator.

Rowntree, Rowan A. 1993. **Atmospheric carbon exchange associated with vegetation and soils in urban and suburban land uses.** In: Edgerton, Sylvia; Mizuno, Tateki, comps. A report from the second U.S./Japan workshop on global change research: environmental response technologies (mitigation and adaptation); 1993 February 1-3; Honolulu, HI. CONF-930285. [Place of publication unknown]: Publisher name unknown]: 257-263.

Rowntree, Rowan; Greenwood, Gregory; Marose, Robin. 1993. **Land use development and forest ecosystems: linking research and management in the central Sierra.** In: Ewert, Alan W.; Chavez, Deborah J.; Magill, Arthur W., eds. Culture, conflict, and communication in the wildland-urban interface. Boulder, CO: Westview Press: 389-398.

Russo, Joseph M.; Liebhold, Andrew M.; Kelley, John G. W. 1993. **Mesoscale weather data as input to a gypsy moth (Lepidoptera: Lymantriidae) phenology model.** Forest Entomology. 86(3): 838-844.

Safford, L. O.; Leak, J. A. 1993. **Estimates of exchangeable calcium, potassium and magnesium in forest soils of the Bartlett Experimental Forest: 1966 versus 1992.** In: Briggs, Russell D.; Krohn, William B., eds. Nurturing the northeastern forest: Proceedings of a joint meeting of the New England Society of American Foresters and Maine Chapter of the Wildlife Society; 1993 March 3-5; Portland, ME. SAF Publ. 93-05. Misc. Rep. 382. Orono, ME: Maine Agricultural and Forestry Experiment Station: 289. Abstract.

Sahm, J. M.; White, E. H.; Abrahamson, L. P.; Nowak, C. A. 1993. **Wood ash applications in willow bioenergy plantations.** In: 1993 Agronomy Abstracts; American Society of Agronomy 85th annual meeting; 1993 November 7-12; Cincinnati, OH. Madison, WI: American Society of Agronomy. 338. Abstract.

Sampson, R. Neil; Apps, Michael; Brown, Sandra; Cole, C. Vernon; Downing, John; Heath, Linda S. 1993. **Workshop summary statement: terrestrial biospheric carbon fluxes-quantification of sinks and sources of CO_2.** Water, Air, and Soil Pollution. 70: 3-15.

Sanchez, V. 1993. **Isozymes and genetic variability in *Compsilura concinnata* (Diptera: Tachinidae).** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency

gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 97. Abstract.

Schaefer, Paul W.; Shields, Kathleen S.; Aldrich, Jeffrey P. 1993. **Larval gypsy moth dorsal abdominal glands: histology, ultrastructure and preliminary chemical identifications of exudate.** In: Shapiro, Jeffrey P., ed. Section B abstracts, 1993 annual meeting of the Entomological Society of America; Indianapolis, IN. [Place of publication unknown]: Entomological Society of America: 25. Abstract.

Scherzer, Amy J. 1993. **Comparative physiology and morphology of different-sized yellow poplar [yellow-poplar].** Bulletin of the Ecological Society of America. 74(2) (Suppl.): 427. Abstract.

Scherzer, Amy L. 1993. **Comparisons of the physiology and structure of different-sized yellow poplar (*Liriodendron tulipifera* L.).** Ohio Journal of Science. 93(2): 48. Abstract.

Schreuder, H. T.; Li, J.; Scott, C. T. 1993. **Estimation with different stratification at two occasions.** Forest Science. 39(2): 368-382.
Because forest surveys may use different strata over time, permanent plots may be remeasured and new plots may be selected with different probabilities. Inclusion probabilities and joint probabilities of selecting both remeasured and new plots are derived.

Schuler, Thomas M. 1993. **Survival, growth, and target canker infection of black walnut families 15 years after establishment in West Virginia.** Res. Pap. NE-674. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 8 p.
The survival, growth, and rate of target canker infection of 34 black walnut families were evaluated 15 years after establishment in north-central West Virginia. The progenies originated at locations in Pennsylvania, West Virginia, Tennessee, and North Carolina. There were significant differences between families in survival, incidence of target canker infection, total height, and diameter at breast height.

Schuler, Thomas M.; Marquis, David A.; Ernst, Richard L.; Simpson, Brian T. 1993. **Test of four stand growth simulators for the northeastern United States.** Res. Pap. NE-676. Radnor PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 14 p.
Evaluates SILVAH, FIBER, NE-TWIGS, and OAKSIM, simulators commonly used in the Northeastern United States by comparing predicted stand development with actual stand development records for periods ranging from 15 to 50 years.

Scott, Charles T. 1993. **Optimal design of a plot cluster for monitoring.** In: Rennolls, Keith; Gertner, George, eds. The optimal design of forest experiments and forest surveys: Proceedings, IUFRO S4.11 conference; 1991 September 10-14; London, UK. London, UK: University of Greenwich: 233-242.
Plot clusters are specified by the type, size, number, and the distance between plots within the cluster. A method for determining the optimal cluster design when different plot types are used for different forest resource attributes is described.

Scott, Charles T. 1993. **Sampling at the forest edge.** IUFRO S4.02 Forest Resource Inventory and Monitoring Newsletter. 14: 19-21.

Scott, Charles T.; Cassell, David L; Hazard, John W. 1993. **Sampling design of the U.S. National Forest Health Monitoring Program.** In: Nyyssonen, Aarne; Poso, Simo; Rautala, Johanna, eds. Proceedings of Ilvessalo symposium on national forest inventories; 1992 August 17-21; Helsinki, Finland. Res. Pap. 444. Helsinki, Finland: Finnish Forest Research Institute: 150-157.
In 1990, the USDA Forest Service, U.S. Environmental Protection Agency, state, and other agencies initiated the Forest Health Monitoring (FHM) Program to monitor current trends in forest-ecosystem conditions in response to pollutant exposure. The FHM Program is part of the Environmental Monitoring and Assessment Program (EMAP). The sampling design used in FHM is based on the EMAP grid of 12,600 hexagons across the continental United States. At each grid point, a 40-km^2 hexagon is to be characterized by a variety of remotely sensed and map-based descriptors. A cluster of plots is visited on the ground in each hexagon. The cluster is composed of a series of nested fixed-radius plots at four points.

Scott, Charles T.; Kohl, Michael. 1993. **Experiences with designing the forest survey of the Northeastern United States.** In: Kohl, Michael; Gertner, George Z., eds. Statistical methods, mathematics and computers: proceedings, IUFRO S4.11-00 meeting; 1992 August 30-September 4; Berlin/Eberswalde, Germany. Birmensdorf, Switzerland: Swiss Federal Institute for Forest, Snow and Landscape Research: 139-148.
Details more than 40 years of experience in conducting regional forest surveys based on the senior author's 14 years with the project and the junior author's experience with the Swiss National Forest Inventory. Recommendations on the design and analysis of regional and national forest surveys are included.

Scott, Charles T.; Kohl, Michael. 1993. **A method for comparing sampling design alternatives for extensive inventories.** Mitteilungen der Eidgenossischen Forschungsanstalt fur Wald, Schnee und Landschaft. 68(1): 3-62.
The cost efficiency of any large-scale, extensive forest inventory is influenced by the sampling design. Many sampling techniques have been suggested, for example, double sampling for stratification and sampling with partial replacement. Models for optimization that can aid in selecting the optimum design from a range of alternatives are presented.

Sendak, Paul E. 1993. **Timber management and use-value assessment in Vermont.** In: Briggs, Russell D.; Krohn, William B., eds. Nurturing the northeastern forest: Proceedings of a joint meeting of the New England Society of American Foresters and Maine Chapter of the Wildlife Society; 1993 March 3-5; Portland, ME. SAF Publ. 93-05. Misc. Rep. 382. Orono, ME: Maine Agricultural and Forestry Experiment Station: 270. Abstract.

Shafer, E. W.; Carline, R.; Guldin, R. W.; Cordell, H. K. 1993. **Economic amenity values of wildlife: six case studies in Pennsylvania.** Environmental Management. 17(5): 669-682.

Sharov, A. A.; Colbert, J. J. 1993. **Medium-size model of gypsy moth: a trade-off between simplicity and biological interpretation.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 99. Abstract.

Shields, K. S. 1993. **Effects of aspen defensive chemistry on efficacy of Bt against gypsy moths. II. Ultrastructural effects on midgut.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 100. Abstract.

Shields, Kathleen S.; Lindroth, Richard L.; Hwang, S. Y. 1993. **Interaction of aspen phenolic glycosides and *Bacillus thuringiensis* in the gypsy moth midgut.** In: Shapiro, Jeffrey P., ed. Section B abstracts, 1993 annual meeting of the Entomological Society of America; Indianapolis, IN. [Place of publication unknown]: Entomological Society of America: 50. Abstract.

Sinclair, Steven A.; Hansen, Bruce G.; Fern, Edward F. 1993. **Industrial forest product quality: an empirical test of Garvin's eight quality dimensions.** Wood and Fiber Science. 25(1): 66-76.

A national sample of purchasing executives was asked to rate 26 product and dealer/manufacturer attributes on the basis of their importance in assessing office furniture quality. Attributes were selected to represent eight quality dimensions—performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Results of confirmatory factor analysis failed to support the eight dimensional structure. However, subsequent exploratory factor analysis utilizing raw and transformed rating scores supported the existence of most dimensions.

Sisinni, Susan M.; Anderson, Marianne O'Hea. 1993. **Methods and results of natural resource assessments in New York City, New York.** Landscape and Urban Planning. 25: 95-114.

In 1985, the New York City Department of Parks and Recreation in cooperation with USDA Forest Service developed methods to evaluate urban natural resources. The project had two phases: a citywide inventory of natural resources and individual park ecological assessments. Results of these studies were used to develop a preliminary data base, citywide natural resources policies, and park-specific management plans. Methods used in New York City can be tailored to the unique conditions of cities throughout the country.

Slavicek, James M.; Garner, Karen. 1993. **A nuclear DNA-based method for identification of the Asian gypsy moth and Asian/European gypsy moth hybrids.** In: Kuharic, Kathryn E., comp. Proceedings, 1993 annual gypsy moth review; 1993 November 1-4; Harrisburg, PA. [Place of publication unknown]: National Gypsy Moth Management Board. 37-38.

Smith, H. Clay. 1993. **Development of red oak seedlings using plastic shelters on hardwood sites in West Virginia.** Res. Pap. NE-672. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7 p.

Plastic shelters were used to grow red oak seedlings on good-to-excellent Appalachian hardwood growing sites in north-central West Virginia. Preliminary results indicate that shelters have the potential to stimulate height growth of red oak seedlings, especially if height growth continues once the seedling tops are above the 5-foot-tall shelters.

Smith, H. Clay. 1993. **Regenerating oaks in the central Appalachians.** In: Loftis, David; McGee, Charles E., eds. 1993. Oak regeneration: serious problems, practical recommendations. Symposium proceedings; 1992 September 8-10, Knoxville, TN. Gen. Tech. Rep. SE-84. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 211-221.

In the central Appalachians, regeneration of oaks on fair-to-poor sites usually is successful using even-age silvicultural methods. However, for the good-to-better growing sites (red oak site index 70+), the establishment and development of natural oak regeneration is of major concern. Keys to establishing oak on the good growing sites include seedling establishment, stimulating seedling height growth, and controlling vegetation competition.

Smith, Harvey R.; Elkinton, Joseph S. 1993. **Vertebrate and invertebrate predators: looking back and looking ahead at gypsy moth predation research.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993, 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 101-105.

Smith, K. T.; Ostrofsky, W. D. 1993. **Cambial and internal electrical resistance of red spruce trees in eight diverse stands in the northeastern United States.** Canadian Journal of Forest Research. 23: 322-326.

Rating systems are being developed to determine the degree to which forests are at risk from pests, pathogens, and anthropogenic disturbances. Measurements of electrical resistance of living trees have been shown to be correlated with cambial growth and alterations of wood function in a wide range of species. A comparison was made of patterns of cambial electrical resistance and of stem internal electrical resistance for eight red spruce stands in the Northeastern United States. There was no direct relationship between internal tree condition and cambial electrical resistance.

Smith, K. T.; Shortle, W. C. 1993. **Compartmentalization response of two clones of hybrid-poplar.** European Journal of Forest Pathology. 23: 11-17.
A 14-day bioassay indicated the effectiveness of compartmentalization evident 24 months following wounding of two clones of hybrid-poplar. The boundary pattern adjacent to columns of wound-initiated discoloration indicated that formation of the column boundary layer was not the sole determinant for the effectiveness of compartmentalization.

Smith, K. T.; Shortle, W. C. 1993. **Effectiveness of compartmentalization of wound-initiated discoloration in red spruce trees of two forest stands.** European Journal of Pathology. 23: 244-251.
The effectiveness of compartmentalization following wounding was tested in red spruce trees at two locations in the Northeastern United States. The test provided a basis to rank the two forest stands on the basis of the effectiveness of compartmentalization.

Smith, Kevin T. 1993. **Helpful and harmful responses to tree treatments.** In: Trees for Europe: proceedings, European Congress of International Society of Arboriculture; 1993 May 2-4; Lahnstein, Germany. Urbana, IL: International Society of Arboriculture: 159-160.

Solomon, Dale S.; Leak, William B. 1993. **Modeling forest productivity using mixed-species habitats in the northeastern United States and Canada.** In: Ung, Chhun-Huor, ed. International workshop, forest growth models and their uses; 1993 November 18-19; Quebec City, PQ. Sainte-Foy, PQ: Canadian Forest Service: 182-191.
The model FIBER was used to simulate productivity of forest stands for six ecological classifications in the Northeastern United States and Canada. Differences in both cubic- and board-foot yields are cumulated over the rotation age of the stand and presented for the different forest habitats. Unthinned stands on softwood habitats produce approximately 50 percent more volume than hardwood stands. However, when thinned, the cumulative cubic-foot volumes are approximately equal while the board-foot yield on softwood habitats remains moderately higher.

Solomon, Dale S.; Leak, William B. 1993. **Modeling the development of forest stands in the Northeast using ecological site classification.** In: Burkhart, Harold E.; Gregoire, Timothy G.; Smith, James L., eds. Modelling stand response to silvicultural practices: proceedings, IUFRO S4.01 conference; 1993 September 27-October 1; Blacksburg, VA. Publ. FWS-1-93 Blacksburg, VA. Virginia Polytechnic Institute and State University: 120-130.
Recent trends in forest management indicate that forest-growth modeling needs to be broadened to reflect stand attributes related to succession, biodiversity, wildlife habitat, and forest esthetics in addition to timber yields. Site index, the most common measure of site productivity in growth models, predicts tree and stand growth accurately but provides little basis for modeling ecological processes. FIBER 3.0 uses habitat classification to reflect ecological dynamics for the major tree species in the forest stands of the Northeast.

Sonderman, David L.; Brisbin, Robert L. 1993. **Directory of training programs for the woodworking industry.** Gen. Tech. Rep. NE-173. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 33 p.
This directory of training programs for the woodworking industry includes a listing of schools, colleges, suppliers, and trade associations. The data base contains descriptions of woodworking courses, types of equipment, and degree of certificate programs that are available.

Steele, Philip H.; Luppold, William; Araman, Philip A.; Jackson, David J. 1993. **Hardwood sawmill band versus circular headrig benefits and costs.** In: FPS 47th annual meeting: biographies & abstracts; 1993 June 20-23; Clearwater Beach, FL. Madison, WI: Forest Products Society: 23. Abstract.

Stevens, Rachel; Yamasaki, Mariko; Pekins, Peter J.; Neefus, Christopher. 1993. **The presence and habitat use of bats in the White Mountain National Forest.** Bat Research News. 34(4): 129. Abstract.

Stevens, Rachel; Yamasaki, Mariko; Pekins, Peter J.; Neefus, Christopher. 1993. **The presence and habitat use of bats in the White Mountain National Forest.** In: 23rd annual North American symposium on bat research; 1993 October 13-16; Gainesville, FL. Potsdam, NY: Potsdam College of State University of New York: 37. Abstract.

Sutherland, Elaine Kennedy; Yaussy, Daniel A.; Dale, Martin E. 1993. **Drought and differential mortality in southern Ohio mixed-oak forests.** Bulletin of the Ecological Society of America. 74(2): 451. Abstract.

Torgersen, Torolf R.; Colbert, J. J.; Hosman, Kevin P. 1993. **Patterns of occurrence and new sampling implications for instar IV western spruce budworm (Lepidoptera: Tortricidae).** Forest Science. 39(3): 573-593.
Examines relations of western spruce budworm larval distribution on terminal tips, whole branches, among crown strata, and within and among whole trees. Study sites were in Washington, Oregon, Idaho, Montana, and New Mexico. A range of densities from 1 to 600 larvae per m^2 of foliage

on midcrown terminal tips was observed. Larval density on nominal 45-cm terminal tips in the lower third of the crown was a slightly better predictor of whole-tree density than on midcrown tips. Equations are given to determine the number of trees to sample for desired precisions and confidence levels.

Twery, M. J.; Elmes, G. A.; Schaub, L. P.; Foster, M. A.; Saunders, M. C. 1993. **GypsES: a decision support system for gypsy moth management.** In: Liebhold, Andrew M.; Barrett, Hope R., eds. Proceedings: spatial analysis and forest pest management; 1992 April 27-30; Mountain Lakes, VA. Gen. Tech. Rep. NE-175. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 56-64.
GypsES is a decision support system for the management of gypsy moth using a knowledge-based geographic information system and multiple knowledge-based modules or "advisors". The advisors provide decision information on forest hazard rating and risk assessment; insect monitoring and prediction; and intervention decision and implementation. The primary objective of GypsES is to model the sequence of evaluations necessary for gypsy moth management decisions.

Twery, Mark J. 1993. **Design and development of the Northeast Decision Model.** Compiler. 11(2): 14-18.
The Northeast Decision Model (NED) is a computer-based, decision-support system being developed by the Northeastern Forest Experiment Station to provide site-specific expert recommendations on silvicultural prescriptions to optimize management of multiple resources on forests of the Northeastern United States. Recommendations will be based on management goals specified by the user, along with data on site and vegetation in a management unit and the surrounding forest.

Twery, Mark J. 1993. **GypsES: current status and future plans for the decision support system for gypsy moth management.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 109. Abstract.

Tyree, M. T.; Cochard, H.; Cruiziat, P.; Sinclair, B.; Ameglio, T. 1993. **Drought-induced leaf shedding in walnut: evidence for vulnerability segmentation.** Plant, Cell and Environment. 16: 879-882.
Trees of *Juglans regia* L. shed their leaves when subjected to drought. Before shedding (when leaves are yellow), the petioles have lost 87 percent of maximum hydraulic conductivity versus only 14 percent for stems. The reason for this disparity is that petioles are more vulnerable to water stress-induced cavitation than stems. This finding is discussed in the context of the plant segmentation hypothesis.

Tyree, M. T.; Sinclair, B.; Lu, P.; Granier, A. 1993. **Whole shoot hydraulic resistance in *Quercus* species measured with a new high-pressure flowmeter.** Annales des Sciences Forestieres. 50: 417-423.
Whole shoot resistance to water flow was measured in *Quercus robur* L., *Q. petraea* Matt Liebl, *Q. pubescens* Willd, and *Q. rubra* L. Shoots 4 to 8 years old were 1.1 to 1.5 m long and 16 to 19 mm in basal wood diameter. Whole shoot resistances accounted for 30 to 40 percent of the total resistance to water flow from soils to leaves based on comparisons with literature values. Leaf blade resistances accounted for 80 to 90 percent of total shoot resistances measured in this study.

Tyree, Melvin T. 1993. **Theory of vessel-length determination: the problem of nonrandom vessel ends.** Canadian Journal of Botany. 71: 297-302.
A theoretical analysis was undertaken to examine the accuracy of algorithms commonly used to compute vessel lengths from paint perfusion experiments. The double-difference (DD) algorithm assumes that all vessels have randomly distributed vessel ends along the axis of the paint-perfused stem and that vessels do not branch. When these conditions were met, the DD algorithm overestimated the frequency of short vessels and underestimated the frequency of long vessels. When these conditions were not met, negative numbers for frequencies were outputted by the DD algorithm.

Tyree, Melvin T.; Alexander, John D. 1993. **Hydraulic conductivity of branch junctions in three temperate tree species.** Trees. 7: 156-159.
Hydraulic conductivities were measured in branch junctions and in the proximal segments of *Quercus velutina* Lam., *Acer saccharum* Marsh., and *Tsuga canadensis* (L.) Carr. In all three species, the basal proximal segment was more conductive than the junction by a factor of 1.1 to 1.5. There was no consistent pattern for the distal proximal segments where the conductivities were higher, lower, or the same as the junction. Junction constrictions to water flow contribute less to plant segmentation than the variation in leaf specific conductivity in the crown of these species.

Tyree, Melvin T.; Alexander, John D. 1993. **Plant water relations and the effects of elevated CO_2: a review and suggestions for future research.** Vegetatio. 104/105: 47-62.
Summarizes work done on the effects of elevated CO_2 on various aspects of plant water relations, including gas exchange, morphology, and internal water stress, and the methods used to carry out this work.

Valaitis, Algimantas P. 1993. **Isolation and kinetic properties of the larval brain phosphofructokinase from the gypsy moth, *Lymantria dispar*.** Comparative Biochemistry and Physiology. 106B(4): 961-967.
Phosphofructo-1-kinase (PFK) was isolated from gypsy moth larval brain by affinity chromatography using ATP-Sepharose. Gypsy moth brain PFK is a tetrameric enzyme composed of a single type of subunit. The insect brain PFK is inactive in the absence of allosteric activators fructose 2,6-bisphosphate or AMP. Citrate antagonized the activation of PFK by cyclic-AMP but was a relatively poor inhibitor of the moth PFK.

Valaitis, Algimantas P.; Bowers, Diana F. 1993. **Purification and properties of the soluble midgut trehalase from the gypsy moth, *Lymantria dispar*.** Insect Biochemistry and Molecular Biology. 23(5): 599-606.
The midgut trehalase (THA) from 5th-instar gypsy moth larvae was purified to homogeneity by gel filtration followed by Rotofor preparative IEF, and affinity chromatography on trehalose coupled to Sepharose 6B followed by preparative polyacrylamide gel electrophoresis. Midgut THA from the last-stadium larvae was mainly in soluble form and displayed a single band of activity in nondenaturing polyacrylamide gels when stained by a THA-specific staining procedure. Analytical IEF of purified midgut THA revealed a single protein band with an apparent pI of 4.6. SDS-PAGE and gel permeation studies indicated that the smallest active form of THA in the late 5th-instar larval midgut was a monomeric protein with an approximate size of 60 kDa.

Valentine, Harry T.; Gregoire, Timothy G.; Furnival, George M. 1993. **Estimation of the aggregate bole volume of a forest by stratified, two-stage, probability sampling.** In: Rennolls, Keith; Gertner, George, eds. The optimal design of forest experiments and forest surveys: proceedings, IUFRO conference; 1991 September 10-14; London, UK. London, UK: The University of Greenwich: 249-257.

Valentine, Harry T.; Gregoire, Timothy G.; Wiant, Harry V., Jr. 1993. **Comparing centroid methods based on importance or control-variate sampling.** In: Wood, G. B.; Wiant, H. V., Jr. Modern methods of estimating tree and log volume: IUFRO conference; 1993 June 14-16; Morgantown, WV. Morgantown, WV: West Virginia University: 86-95.
The centroid method can be used to estimate the volume of a bole, bole segment, or log from a measurement of diameter at the predicted centroid—the height or length to half the predicted volume. These estimates usually are calculated with the importance-sampling estimator. In this study, the performance of an alternative centroid estimator, the control-variate estimator, was compared to that of the importance-sampling estimator.

Vander Stoep, Gail A., ed. 1993. **Proceedings of the 1992 northeastern recreation research symposium**; 1992 April 5-7; Saratoga Springs, NY. Gen. Tech. Rep. NE-176. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 171 p.
Includes 32 research and management papers on the following subjects: social science in resource management; outdoor recreation planning and management; wildlife and fisheries management; environmental concern; travel and tourism; recreation and resource economics; measurement and modeling psychology and leisure; USDA Forest Service issues and National Park Service issues.

Vander Stoep, Gail A. 1993. **Proceedings of the 1993 northeastern recreation research symposium**; 1993 April 18-20; Saratoga Springs, NY. Gen. Tech. Rep. NE-185. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 229 p.
Includes 40 research and management papers on the following subjects: trends in recreation research and management; social science in resource management; outdoor recreation management and planning; greenways; urban recreation; landscape and visual perceptions; economic development aspects of travel and tourism; travel and tourism behavior; recreation resource management; recreation demographics; and social psychology and recreation.

Wade, Gary L.; Thompson, Ralph L. 1993. **Species richness on five partially reclaimed Kentucky surface mines.** In: Zamora, Benjamin A.; Connolly, Randall E., eds. The challenge of integrating diverse perspectives in reclamation: proceedings, 10th annual national meeting of American Society for Surface Mining and Reclamation; 1993 May 16-19; Spokane, WA. ASSMR 10-93. Princeton, WV: American Society for Surface Mining and Reclamation: 307-314.
Floristic studies were conducted on five surface mines in Kentucky that were mined and reclaimed before the Surface Mine Control and Reclamation Act of 1977. The sites ranged from 12 to 25 years of age and from 12 to 14 hectares; the number of species planted on each mine at the time of reclamation ranged from 3 to 110. Mean species richness was 313. The number of species on each mine was 2 to 12 percent below the number expected on areas of these sizes within the Mixed and Western Mesophytic Region. Eighty-two percent of the mine floras were native species. Species richness was significantly correlated with mine area, and number of invading species was significantly correlated with median pH of mine soils.

Wade, Gary L.; Tritton, Louise M. 1993. **Evaluating biodiversity in natural areas.** In: Conservation in working landscapes 20th annual natural areas conference; 1993 June 22-26; Orono, ME. Orono, ME: University of Maine: 90-91. Abstract.

Wagner, D. L.; Peacock, J. W. 1993. **Preliminary results of Bt field studies in Rockbridge County, Virginia.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 112. Abstract.

Wallner, W. E. 1993. **Asian gypsy moth research and development program.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 113. Abstract.

Walters, Russell S. 1993. **Protecting red oak seedlings with tree shelters in northwestern Pennsylvania.** Res. Pap. NE-679. Radnor, PA: U.S. Department of

Agriculture, Forest Service. Northeastern Forest Experiment Station. 5 p.
Examines the growth and survival of planted and natural red oak seedlings and seedlings from planted acorns within translucent tan tree shelters, fences, and unprotected controls under a shelterwood seed-cut stand. Seedlings planted within tree shelters and fences were inside tree shelters. Nautral seedlings grew little and their height inside and outside of tree shelters did not differ.

Walters, Russell S.; Auchmoody, L. R. 1993. **Factors limiting northern red oak reproductions in Pennsylvania.** In: Gillespie, Andrew R.; Parker, George R.; Pope, Phillip E.; Rink, George, eds. Proceedings, 9th central hardwood forest conference; 1993 March 8-10; West Lafayette, IN. Gen. Tech. Rep. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 271-280.
Scientists are attempting to manipulate factors that limit the establishment and development of northern red oak seedlings in second-generation stands on high-quality sites. The major causes of regeneration failure in oak stands are low numbers and/or small size of oak advance reproduction. The small number of natural red oak seedlings results from infrequent seed crops and destruction of acorns by insects, deer, and small mammals. These agents contribute to the slow development and mortality of established seedlings.

Wargo, P. M. 1993. **Multiple factors in oak decline in the United States.** In: Luisi, Nicola; Lerario, Pierdominico; Vannini, Andrea, eds. Recent advances in studies on oak decline: proceedings of an international congress; 1992 September 13-18; Brindisi, Italy. Bari, Italy: Tipolitografia Radio-Putignano: 1-9.
Oak decline is initiated primarily by insect defoliation, drought, or frost damage. In the Northeast, defoliation has been the major inciting factor, while drought has been most important in the Southeast, South, and Midwest. Stressed oaks are attacked primarily by three organisms considered opportunistic and secondary in sequence of attack, but not necessarily in importance, in causing mortality in declining oak stands: a root-disease fungus, *Armillaria* spp., stem canker fungus, *Hypoxylon atropunctatum*, and the twolined chestnut borer, *Agrilus bilineatus*.

Wargo, P. M.; Bergdahl, D. R.; Tobi, D. R.; Olson, C. W. 1993. **Root vitality and decline of red spruce.** Contributiones biologiae arborum, vol. 4. Landsberg/ Lech, Germany: ECOMED Verlagsgesellschaft. 134 p.
Describes a study conducted to determine the relationship between root vitality and crown deterioration for both healthy and declining red spruce trees.

Wargo, Philip M. 1993. **Ecology of *Armillaria gallica* in mixed oak forests.** In: Abstracts, 6th international congress of plant pathology; 1993 July 28-August 6; Montreal, PQ. [Place of publication unknown]: [Publisher name unknown]: 124. Abstract.

Wargo, Philip M. 1993. **Species of *Armillaria* causing root disease of blueberry in Massachusetts.** Phytopathology. 83(2): 248. Abstract.

Wargo, Philip M.; Twery, Mark J. 1993. **Secondary organisms and oak mortality after defoliation by the gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 116. Abstract.

Webb, R. E.; Shapiro, M.; Podgwaite, J. D.; Lynn, D. E.; Dougherty, E. M.; Ridgway, R. L.; Venables, L.; Cohen, D. L. 1993. **Field comparison of different strains of gypsy moth nuclear polyhedrosis virus against gypsy moth (Lepidoptera: Lymantriidae) in western Maryland in 1990.** Journal of Economic Entomology. 86(4): 1185-1190.
Gypchek, the LDP226 strain of the nuclear polyhedrosis virus of the gypsy moth, was compared in small forest plots with Abington isolate (Pass 10), each at three dosages. Also evaluated were one dose of virus produced in cell culture, one dose of Gypchek applied without sunscreen, and an untreated control. A dose-response was demonstrated for both the Abington and Gypchek strains. The Abington isolate killed significantly faster than the Gypchek strain, but there was no statistical difference in larval mortality between the two products.

Welsh, Christopher J. E.; Healy, William M. 1993. **Effect of even-aged timber management on bird species diversity and composition in northern hardwoods of New Hampshire.** Wildlife Society Bulletin. 21: 143-154.
Diversity of bird species on managed areas of extensively forested northern hardwood forest in New Hampshire was greater and included a greater variety of species then on unmanaged areas. Sawlog-timber management appeared to produce small and infrequent disturbances, suggesting an increase in diversity of songbirds and no loss of species.

West, Cynthia D. 1993. **The chip mill factor.** In: FPS 47th annual meeting: biographies & abstracts; 1993 June 20-23; Clearwater Beach, FL. Madison, WI: Forest Products Society: 19. Abstract.

West, Cynthia D. 1993. **Exports of basic timber resources: who wins and who loses.** In: Agriculture's changing horizon: Proceedings, agriculture outlook '93: 69th annual outlook conference; 1992 December 1-3; Washington, DC. Washington, DC: U.S. Department of Agriculture: 254-262.
Increasing trade of basic wood resources has raised concerns about prices of domestic wood products and the ability of U.S. forests to continue to adequately supply domestic and world markets. Issues relating to the question of winners and losers in the export trade of softwood and hardwood logs and chips are explored.

Wharton, Eric H.; Griffith, Douglas M. 1993. **Methods to estimate total forest biomass for extensive forest surveys: applications in the northeastern U.S.** Res. Pap NE-681. Radnor, PA: U.S. Department of

Agriculture, Forest Service, Northeastern Forest Experiment Station. 52 p.

Presents methods for synthesizing information from existing literature when making biomass assessments over extensive geographic areas, such as for a state or region. General applications to the northeastern United States and specific applications to Ohio are described. Tables of appropriate regression equations and tree and shrub species to which these equations can be applied are included.

Wharton, Eric H.; Mullarkey, Kevin. 1993. **Forest products industries of the southern Middle-Atlantic states, 1985-1986.** Resour. Bull. NE-129. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 40 p.

Evaluates regional timber output of Maryland, Delaware, and New Jersey. Results are based on a survey of primary processing mills located in these states that used wood from the region. Includes statistics on industrial timber production and mill receipts, and the production and final end use of manufacturing residues. Comparisons are made between historical and current data, and trends in industrial wood input are noted.

Widmann, Richard H. 1993. **A glimpse of Penn's woods.** NE-INF-118-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

Wilder, J. W.; Christie, I.; Colbert, J. J. 1993. **Modelling of 1-dimensional spatial effects on the spread of gypsy moths.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 119. Abstract.

Wilder, J. W.; Colbert, J. J. 1993. **The effects of seasonal dynamics on a three variable, spatially homogeneous model for gypsy moth population dynamics.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 120. Abstract.

Wilder, J. W.; Colbert, J. J.; Sharov, A. A.; Voorhis, N. V. 1993. **A three variable, spatially homogeneous model for gypsy moth population dynamics.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 121. Abstract.

Williams, D. W.; Fuester, R. W.; Metterhouse, W. W.; Balaam, R. J.; Bullock, R. H.; Chianese, R. J.; Reardon, R. C. 1993. **Incidence and ecological relationships of pupal parasitism by *Brachymeria intermedia* in New Jersey populations of the gypsy moth.** Entomophaga. 38(2): 257-266.

Pupal parasitism of the gypsy moth was monitored in 15 study plots in New Jersey from 1978 to 1988. The predominent parasitoid was a chalcidid wasp, *Brachymeria intermedia* (Nees), which was found in only six plots. Parasitism generally was observed in the year of or preceding the peak numbers of gypsy moth egg masses. Parasitism exceeded 4 percent in only one plot. Percentage parasitism was correlated significantly with numbers of egg masses per hectare in the current season and with numbers of pupae per plot in the previous season, suggesting delayed density dependence.

Williams, L. E.; Williams, D. W.; Phene, C. J. 1993. **Modelling grapevine water use.** In: Stockley, Creina S.; Johnstone, Russell S.; Leske, Peter A.; Lee, Terry H., eds. Proceedings, 8th Australian wine industry technical conference; 1992 October 25-29; Melbourne, Australia. Adelaide, Australia: Winetitles: 29-33.

Discusses two different methods of modelling vine water use. In the first method, a resistance-energy balance equation is used to predict vine water use. This method could be incorporated into a simulation model of vine growth and provide data on vine water relations and their effect on vegetative and reproductive growth. In the second method, to predict vineyard water use, crop coefficients are used. This method also could be included in expert systems to assist growers with irrigation decisions.

Willis, Raymond B.; Schwab, Gregory J.; Gentry, Claude E. 1993. **Elimination of interferences in the colorimetric analysis of ammonium in water and soil extracts.** Communications in Soil Science and Plant Analysis. 24 (9&10): 1009-1019.

The manual method for analyzing ammonium (NH_4) in water and 1 M potassium chloride soil extracts using the Berthelot reaction was studied with the goal of eliminating interferences from commonly found ions. Three complexing agents at varying concentrations were evaluated. A 12 percent solution of sodium citrate eliminated normal interferences in soil extracts and natural waters and was chosen as the best of the three.

Wilmot, Sandra H.; Parker, Bruce L.; ODell, Thomas M. 1993. **Sampling parasitoids in host-augmented gypsy moth (Lep.: Lymantriidae) populations.** Journal of Applied Entomology. 116: 62-71.

Witcosky, Jeffrey L.; Dubois, Normand R.; Mierzejewski, Karl J.; Sellers, Patricia A.; Reardon, Richard C. 1993. **Field efficacy of *Bacillus thuringiensis* Thuricide 64LV applied undiluted at two different drop sizes for control of third and fourth instar gypsy moth infestations.** In: Kuharic, Kathryn E., comp. Proceedings, 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 103-107.

Yamasaki, Mariko. 1993. **Effects of land-use and management practices in the presence of brown-**

headed cowbirds in the White Mountains of New Hampshire and Maine. Partners in Flight. 4(1): 51. Abstract.

Yamasaki, Mariko; Leak, William B.; DeGraaf, Richard M. 1993. **Forest manipulations for enhancing wildlife habitat.** In: Briggs, Russell D.; Krohn, William B., eds. Nurturing the northeastern forest: Proceedings of a joint meeting of the New England Society of American Foresters and Maine Chapter of the Wildlife Society; 1993 March 3-5; Portland, ME. SAF Publ. 93-05. Misc. Rep. 382. Orono, ME: Maine Agricultural and Forestry Experiment Station: 57-73.

Yang, Shudong; Tyree, Melvin T. 1993. **Hydraulic resistance in *Acer saccharum* shoots and its influence on leaf water potential and transpiration.** Tree Physiology. 12: 231-242.
Discusses a simple method for measuring resistances and conductances on excised whole shoots. From such measurements, resistances that can be extrapolated to whole trees were obtained.

Yang, X.; Miller, D. R.; Montgomery, M. E. 1993. **Biologically active radiation environment in a hardwood forest.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1993; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 123. Abstract.

Yang, Xiusheng; Miller, David R.; Montgomery, Michael E. 1993. **Vertical distributions of canopy foliage and biologically active radiation in a defoliated/refoliated hardwood forest.** Agricultural and Forest Meteorology. 67: 129-146.

Yaussy, Daniel A. 1993. **Method for estimating potential tree-grade distributions for northeastern forest species.** Res. Pap. NE-670. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 12 p.
Generalized logistic regression was used to distribute trees into four potential tree grades for 20 northeastern species groups. Potential tree grade is based on the length and amount of clear cuttings and defects only; minimum grading diameter is disregarded. The algorithms described use site index and tree diameter as the predictive variables, allowing the equations to be incorporated into individual-tree growth and yield simulators such as NE-TWIGS.

Yaussy, Daniel A. 1993. **NE-TWIGS update: incorporating tree quality.** Compiler. 11(1): 8-10, 12.
A method to distribute tree quality was incorporated into the NE-TWIGS individual-tree growth and yield simulator. The program uses potential tree grade to allow changes in actual tree grade over time. Volume is reported by grade and value is calculated using tree grades.

Yaussy, Daniel A.; Sutherland, Elaine Kennedy. 1993. **Fire history in the Ohio River Valley and its relation to climate.** In: Proceedings of the 12th international conference on fire and forest meteorology; 1993 October 26-28; Jekyll Island, GA. Bethesda, MD: Society of American Foresters: 777-786.

Zipperer, Wayne C. 1993. **Analysis of population growth and forest loss.** In: Neville, L. Robert; Zipperer, Wayne C., tech. coords. New York-New Jersey Highlands Regional Study: analysis of selected resources. NA-TP-04-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry: 71-81.

Zipperer, Wayne C. 1993. **Deforestation patterns and their effects on forest patches.** Landscape Ecology. 8(3): 177-184.
Five patterns of deforestation are recognized—internal, indentation, cropping, fragmentation, and removal. Each has a distinct effect on habitat quality of forest patches in the East. By overlaying land-use maps from 1973 and 1981 for three counties in Maryland, changes in the interior core area and edge length of individual patches were measured. Forest interior declined by 23.8 km^2 in Prince Georges and 8.4 km^2 in Wicomico Counties. Within Anne Arundel and Prince Georges Counties, deforestation increased edge length by 52.1 km and 31.2 km, respectively; within Wicomico, it decreased by 8.7 km.

Zipperer, Wayne C. 1993. **Effects of urbanization on natural resource management.** In: Briggs, Russell D.; Krohn, William B., eds. Nurturing the northeastern forest: proceedings, joint meeting of the New England Society of American Foresters and Maine Chapter of the Wildlife Society; 1993 March 3-5; Portland, ME. SAF Publ. 93-05; CFRU Inf. Rep. 33; Misc. Rep. 382. Portland, ME: Maine Agricultural and Forestry Experiment Station: 153-165.
Parcelization is a process that divides a single ownership into two or more ownerships. Fragmentation is a deforestation process that divides a large contiguous forest parcel into two or more discontinuous parcels. Each of these processes can result from development activities in rural areas and directly and indirectly affect natural resource management. Direct effects result in the conversion of forest lands to other land uses. In the Northeast, predominant conversions include urbanization and water development projects.

Zipperer, Wayne C.; Birch, Thomas W. 1993. **Forest-land ownership patterns.** In: Neville, L. Robert; Zipperer, Wayne C., tech. coords. New York-New Jersey Highlands regional study: analysis of selected resources. NA-TP-04-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry: 67-70.
A study of forest-land owners within the New York-New Jersey Highlands regional study area identified five changes in ownership patterns: more people currently own forest land than ever before; retirees represent a major portion of forest-land owners; more people are living on or closer to their forest tracts than previously observed; more people reared in small cities or towns are purchasing forest parcels; and more owners intend to harvest timber products than previously.

Zwick, Rodney R.; Glass, Ronald J.; More, Thomas A. 1993. **Motivation/importance typology of natural resource harvesters.** In: Vander Stoep, Gail A., ed., comp. Proceedings of the 1993 northeastern recreation research symposium; 1993 April 18-20; Saratoga Springs, NY. Gen. Tech. Rep. NE-185. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 145-150.
Factor analysis of attribute and motive scores collected from 392 residents in Vermont revealed four separate factors/scales of harvesting motives for respondents engaged in hunting and fishing. Three motivational factors emerged in the reduction of motivation and importance scores for berrying/mushrooming. Factor scores were used in a subsequent cluster analysis for each of the three harvesting activities. Five clusters of motivational dimensions emerged for each activity. Motivational clusters were significantly different in participation rates across all three activities. Hunting clusters were significantly different in numbers of specialized equipment used.

1994

Adams, Edward L. 1994. **Procedures for evaluating performance of CNC routers.** In: 3rd international symposium on tooling for the wood industry; 1994 May 11-13; Raleigh, NC. Raleigh, NC: North Carolina State University: 1-11.
The lack of standards for evaluating computer numerically controlled (CNC) routers makes it difficult for buyers and sellers of these machines to communicate with each other when trying to determine the best machine for a given production situation. Procedures that can be used to evaluate specific capabilities of a CNC router for a given production situation are described.

Adams, Mary Beth; Kochenderfer, James N.; Wood, Frederica; Angradi, Ted R.; Edwards, Pamela. 1994. **Forty years of hydrometeorological data from the Fernow Experimental Forest, West Virginia.** Gen. Tech. Rep. NE-184. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 24 p.
Hydrometeorological data have been collected on the Fernow Experimental Forest in West Virginia since 1951. This publication summarizes these data, describes their collection, and provides other information that characterizes the Fernow. The value and utility of long-term data sets are discussed.

Alexeyev, Vladislav A.; Birdsey, Richard A. 1994. **Carbon in ecosystems of forests and peatlands of Russia.** Russia: Russian Academy of Sciences, Siberian Branch, V. N. Sukachev Institute. 170 p.

Anderson, James D.; Brunner, Charles C.; Thomas, R. Edward; Gatchell, Charles J. 1994. **Computer programs for comparing gang-rip-first and crosscut-first sawing systems.** In: Forest Products Society 48th annual meeting: bibliographies and abstracts; 1994 June 26-29; Portland ME: Forest Products Society: 36. Abstract.

Anderson, Marianne O'Hea; Sisinni, Susan M. 1994. **New York City's urban wilderness.** Urban Forests. 14(1): 12-14.

Araman, Philip A.; Wiedenbeck, Janice K. 1994. **Preliminary full-scale tests of the center for automated processing of hardwoods' auto-image detection and computer-based grading and cutup system.** In: Szymani, Ryszard, ed. Proceedings, 22nd international symposium on computers in furniture and cabinet manufacturing; 1994 August 23-24; Atlanta, GA. Berkeley, CA: Wood Machining Institute: 163-167.

Auchmoody, L. R.; Smith, H. Clay; Walters, Russell S. 1994. **Planting northern red oak acorns: is size and planting depth important?** Res. Pap. NE-693. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5 p.
A study was conducted in northern Pennsylvania to determine whether predation by small mammals and insects is related to the size of red oak acorns. Three sizes of acorns were used along with two planting techniques and three levels of overstory shading. Three-year results indicated that acorn size is not a factor in mammal and insect predation. Acorn size did not affect 3-year survival.

Bailey, Sarah; Loats, Ken; Rebbeck, Joanne. 1994. **Effects of CO_2 enrichment and ozone on the growth and gas exchange of duck weeds.** Ohio Journal of Science. 94(2): 10.

Baranchikov, Y. N.; Wallner, W. E.; Carde, R. T.; Levin, R. E.; Turova, G.; Humble, L.; Yurchenko, G. 1994. **Flight dynamics of three species of Lepidoptera toward different sources of electric lights in Premori Kral Region.** [in Russian]. Krasnoyarsk, Russia: Academy of Sciences, Siberian branch, V.N. Sukachev Institute of Forest: 4-21.

Baranchikov, Yuri N.; Montgomery, Michael E. 1994. **Tree suitability for Asian, European and American populations of gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 4. Abstract.

Barger, J. H.; Cannon, W. N., Jr.; Hall, R. W. 1994. **Long-term effects of enriched carbon dioxide (CO_2) and ozone (O_3) atmospheres on elm leaf beetle (ELB) performance.** Ohio Journal of Science. 94(2): 12.

Bauer, Leah S.; Sapio, Frank J.; McManus, Michael L.; Maddox, Joseph V.; Jeffords, Micahel R.; Onstad, David W. 1994. **Interactions of microsporidium and gypsy moth in Michigan field plots.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S.

Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 5. Abstract.

Baumgras, J. E.; LeDoux, C. B.; Sherar, J. R. 1994. **Harvesting costs and environmental impacts associated with skyline yarding shelterwood harvests and thinning in Appalachian hardwoods.** In: Foresters together: meeting tomorrow's challenges: proceedings of the 1993 Society of American Foresters national convention; 1993 November 7-10; Indianapolis, IN. SAF Publ. 94-01. Bethesda, MD: Society of American Foresters: 579-580.

To evaluate the potential for moderating the visual impact and soil disturbance associated with timber harvesting on steep-slope hardwood sites, thinning and shelterwood harvests were conducted with a skyline yarding system. Yarding costs for thinning were 30 and 33 percent higher than for a conventional and irregular shelterwood, respectively. Ninety percent of the harvested area on all sites had little or no soil disturbance.

Bergdahl, D. R.; Bove, J. R.; Sendak, P.; Tobi, D. 1994. **The use of ARC/INFO to determine amounts of decay and merchantable wood in diseased sugar maple trees.** In: NEARC conference; 1993 October 18-20; Burlington, VT. [Place of publication unknown]: [Publisher name unknown]: 28.

Bergdahl, D. R.; Bove, J. R.; Sendak, P. E.; Tobi, D. R. 1994. **Using a geographic information system to quantify volumes of defect, decay and merchantable wood in diseased sugar maples.** Phytopathology. 84(10): 1144.

Birch, Thomas W.; Stelter, Cecile M. 1994. **Trends in owner attitudes.** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 50-60.

About half the private forest-land owners in Pennsylvania have harvested timber from their holdings at some time in the past. This is nearly double the number of owners who had harvesting experience 14 years earlier. Owners have developed a more positive attitude toward timber cutting at a time when there is greater demand for forest products.

Bischoff, D. S.; Flaherty, K. M.; Hensel, D.; Mercer, M. J.; Kelly, M. E.; Hayes-Plazolles, N. L.; Slavicek, J. M. 1994. **Identification of five genomic loci in the baculovirus LdMNPV that impact polyhedra formation.** In: 13th annual meeting of American Society for Virology: program abstracts; 1994 July 9-13; Madison, WI. [Place of publication unknown]: American Society for Virology: 169. Abstract.

Bischoff, D. S.; Flaherty, K. M.; Hensel, D.; Mercer, M. J.; Kelly, M. E.; Hayes-Plazolles, N. L.; Slavicek, J. M. 1994. **Identification of several genomic loci in the baculovirus LdMNPV that impact polyhedra formation and morphology.** In: 6th international colloquium on invertebrate pathology and microbial control: Abstracts, vol. II; 1994 August 28-September 2; Montpellier, France. [Place of publication unknown]: Society for Invertebrate Pathology: 148. Abstract.

Bischoff, D. S.; Slavicek, J. M. 1994. **Identification of the 25K gene of the *Lymantria dispar* nuclear polyhedrosis virus.** In: Applications of biotechnology to tree culture, protection, and utilization: proceedings of papers presented at the 2nd international symposium: 1994 October 2-6; Bloomington, MN. Gen. Tech. Rep. NC-175. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 54. Abstract.

Bischoff, Dave; Flaherty, Kim; Hensel, Dana; Mercer, Melissa; Hayes-Plazolles, Nancy; Slavicek, James. 1994. **Identification of five mutant loci that generate a few polyhedra phenotype in the *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 7. Abstract.

Bischoff, David S.; Riegel, Christopher I; Slavicek, James M. 1994. **Sequence characterization and temporal expression of the *Lymantria dispar* nuclear polyhedrosis virus immediate-early gene G22.** In: Applications of biotechnology to tree culture, protection, and utilization: proceedings of papers presented at the 2nd international symposium; 1994 October 2-6; Bloomington, MN. Gen. Tech. Rep. NC-175. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 55. Abstract.

Bischoff, David S.; Slavicek, James M. 1994. **Identification and characterization of a protein kinase gene in the *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus.** Journal of Virology. 68(3): 1728-1736.

The *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus (LdMNPV) gene encoding vPK has been cloned and sequenced. LdMNPV vPK shows a 24-percent amino acid identity to the catalytic domains of the eucaryotic protein kinases nPKC from rabbits, HSPKCE from humans, APLPKCB from *Aplysia californica*, and dPKC98F from *Drosophila melanogaster*, and homology to several other protein kinases from yeasts, mice, and bovines. The homology suggests that vPK is a serine/threonine protein kinase.

Bodganowicz, S. M.; Wallner, W. E.; Bell, J.; ODell, T. M.; Harrison, R. G. 1994. **Asian gypsy moth (Lepidoptera: Lymantriidae) in North America: evidence from molecular data.** Annals of the Entomological Society of America. 86(6): 710-715.

Bowers, D.; Valaitis, A. 1994. **Analysis of the glycan moiety of trehalase purified from *L. dispar* gut.** FASEB Journal. 8(5): A935. Abstract.

Bowers, Diana F.; Valaitis, Algimantas P. 1994. **Gas chromatography/mass spectrometry carbohydrate analysis of gypsy moth trehalase.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 10. Abstract.

Brooks, Robert T. 1994. **A regional-scale survey and analysis of forest growth and mortality as affected by site and stand factors and acidic deposition.** Forest Science. 40(3): 543-557.
Identifies major temporal or spatial changes in growth or mortality that may be caused by high levels of atmospheric deposition in western and central Pennsylvania. Explores relationships between growth or mortality and deposition estimates over a large area with significant "acid rain".

Brooks, Robert T.; Doyle, Katherine L. 1994. **White-belted coloration in a Masked Shrew, *Sorex cinereus*, from Massachusetts.** Canadian Field-Naturalist. 108(4): 491-492.
A masked shrew (*Sorex cinereus*) with white-belted coloration pattern was captured in a mixed deciduous-coniferous forest in central Massachusetts. Only one other published record of this pelage condition in *S. cinereus* was found in the literature, and no similarly colored specimens were found in collections of several national or regional museums.

Brown, Sandra; Iverson, Louis R.; Lugo, Ariel E. 1994. **Land-use and biomass changes of forests in Peninsular Malaysia from 1972 to 1982: a GIS approach.** In: Dale, Virginia H., ed. Effects of land-use change on atmospheric CO_2 concentrations. New York: Springer-Verlag: 117-143.
Two maps depicting forest resources of Peninsular Malaysia, one dated 1972 and the other 1982, were digitized into ARC/INFO for analysis of spatial and temporal trends. Estimates of 1972 and 1982 biomass density for each of 11 forest classes were produced from inventory stand tables. Forest area was reduced by 17 percent and total biomass by 28 percent, though these percentages varied by forest class. These data indicate that, in addition to loss of forest biomass due to changes in land use, biomass degradation also was occurring within the forests.

Burkman, William; Casey, Lloyd; Haack, Robert; Kabuich, Steve; Kucera, Dan; McWilliams, Will. 1994. **Northeastern area forest health report 1992.** NA-TD-01-94. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 61 p.

Burrill, E. A.; Worrall, J. J.; Wargo, P. M. 1994. **Effects of thinning and defoliation on *Armillaria* and a potential antagonist.** Phytopathology. 84: 1106. Abstract.

Buxbaum, C. A. Z.; White, E. H.; Nowak, C. A. 1994. **Nutrient cycling in aggrading forests: 50 years of research at Pack Forest, NY.** In: 1993 Agronomy Abstracts: American Society of Agronomy 85th annual meeting; 1993 November 7-12; Cincinnati, OH. Madison, WI: American Society of Agronomy: 333. Abstract.

Byington, T. Scott; Gottschalk, Kurt W.; McGraw, James B. 1994. **Within-population variation in response of red oak seedlings to herbivory by gypsy moth larvae.** American Midland Naturalist. 132: 328-339.

Cannon, W. N., Jr.; Barger, J. H.; Hall, R. W. 1994. **Response of gypsy moth larvae to multi-year exposure of white oak to CO_2-enriched atmosphere.** Ohio Journal of Science. 94(2): 13. Abstract.

Carey, Eileen V.; Brown, Sandra; Gillespie, Andrew J. R.; Lugo, Ariel E. 1994. **Tree mortality in mature lowland tropical moist and tropical lower montane moist forests of Venezuela.** Biotropica. 26(3): 2255-2265.

Carpenter, Constance; Smith, Marie-Louise. 1994. **Ecological classification and mapping (ECOMAP) in the Northeast: a tool for ecosystem management.** In: McEvoy, Thom J., ed. Ecosystem management: Proceedings of a Symposium; 1994 July 18-19; Burlington, VT. Burlington, VT: University of Vermont: 46-52.

Carter, Jane L.; Peacock, John W.; Schweitzer, Dale F.; Dubois, Normand R. 1994. **A laboratory assessment of the effects of *Bacillus thuringiensis* on non-target Lepidoptera.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 12. Abstract.

Carter, Jane L.; Ravlin, William; Fleischer, Shelby L. 1994. **Sequential egg mass sampling plans for gypsy moth (Lepidoptera: Lymantriidae) management in urban and suburban habitats.** Journal of Economic Entomology. 87(4): 999-1003.

Carter, Jane L.; Ravlin, F. William; Gray, David R.; Carter, Mark R.; Coakley, Clint W. 1994. **Foliage presence and absence effect on gypsy moth (Lepidoptera: Lymantriidae) egg mass sample counts and the probability of exceeding thresholds with foliage present.** Journal of Economic Entomology. 87(4): 1004-1007.

Carter, M. R.; Ravlin, F. W.; McManus, M. L. 1994. **Estimating gypsy moth (Lepidoptera: Lymantriidae) egg mass density using male moths captured in pheromone-baited, milk carton traps.** Environmental Entomology. 23(3): 556-561.

Christoforo, John C.; Bush, Robert J.; Luppold, William G. 1994. **A profile of the U.S. pallet and container industry.** Forest Products Journal. 44(2): 9-14.

Clancy, Karen M.; Augustin, Sylvie; Valaitis, Algimantas P. 1994. **Comparison of the major midgut proteinases of laboratory-reared and field collected western spruce budworm.** FASEB Journal. 8(7): A1369. Abstract.

Cochard, H.; Ewers, F. W.; Tyree, M. T. 1994. **Water relations of a tropical vine-like bamboo (*Rhipidocladum racemiflorum*): root pressures, vulnerability to cavitation and seasonal changes in embolism.** Journal of Experimental Botany. 45(277): 1085-1089.

Root pressure, vulnerability of xylem vessels to drought-induced cavitation, and seasonal changes in hydraulic cavitation due to embolism were studied in the culms of *Rhipidocladum racemiflorum* (Steud.) McClure, a tropical vine-like bamboo from central Panama. Positive hydrostatic potentials up to 120 kPa occurred only during the wet season when the transpiration rate of the plant was low, i.e., at night or during rain events. Although the xylem vessels were large and efficient for conducting water, they were highly resistant to cavitation.

Cook, Stephen P.; Hain, Fred P.; Smith, Harvey R. 1994. **Oviposition and pupal survival of gypsy moth (Lepidoptera: Lymantriidae) in Virginia and North Carolina pine-hardwood forests.** Environmental Entomology. 23(2): 360-366.

Cooper, Robert J.; Dodge, Kevin M ; Thurber, Dale K.; Whitmore, Robert C.; Smith, Harvey R. 1994. **Response of ground-level wildlife food plants to canopy defoliation by the gypsy moth.** Proceedings of the annual conference southeastern association of fish and wildlife agencies. 47: 268-275.

Crow, Garrett E.; Ritter, Nur P.; McCauley, Kathleen M.; Padgett, Donald J. 1994. **Botanical reconnaissance of Mountain Pond Research Natural Area.** Gen. Tech. Rep. NE-187. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.

A botanical survey of Mountain Pond Research Natural Area in the White Mountain National Forest, New Hampshire, was conducted in 1991-92. Seventy-eight species of vascular plants representing 35 families were recorded. None are protected under the "Endangered Species Act" and only one species is listed by New Hampshire as having "special concern" status. Baseline information is provided on plant communities and diversity, and relative abundance of vascular plants within the Research Natural Area.

Cunningham, J. C.; Brown, K. W.; Langevin, D.; Grant, G. G.; Robinson, A.; Podgwaite, J. D.; Reardon, R. C. 1994. **Preliminary report on the experimental aerial application of virus and *Bacillus thuringiensis* on gypsy moth in Ontario in 1992.** In: Proceedings, 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 86-93.

Daigle, John J.; Watson, Alan E.; Haas, Glenn E. 1994. **National forest trail users: planning for recreation opportunities.** Res. Pap. NE-685. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 13 p.

Trail users in national forests in four U.S. regions are described based on participation in clusters of recreation activities. Visitors were classified by day hiking, undeveloped recreation, and two developed camping and hiking activity clusters. Distance and time traveled to national forest sites from home varied among activity clusters, as did length of time at a site.

Dale, Virginia H.; Brown, Sandra; Flint, Elizabeth P.; Hall, Charles A. S.; Houghton, Richard A.; Iverson, Louis R.; Richards, John R.; Uhlig, James. 1994. **Estimating CO_2 flux from tropical forests.** In: Dale, Virginia W., ed. Effects of land-use change on atmospheric CO_2 concentrations. New York: Springer-Verlag: 365-378.

The flux of CO_2 from terrestrial systems is determined by changes in biomass density, soil carbon, and land use of the major cover types. Biomass density is estimated by geographic information systems modeling, analysis of historical records, or country-specific volume data. These approaches are improving estimates of biomass densities. Variations between estimates can be explained by the classification of forest categories, methods used to estimate forest degradation, and basic assumptions on the importance of floristics and climate on species distribution.

D'Amico, Vincent; Elkinton, Joseph S.; Wood, H. Alan; Podgwaite, John D.; McManus, Michael L.; Slavicek, James; Burand, John P. 1994. **A field test of genetically engineered gypsy moth NPV.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 16. Abstract.

D'Amico, Vincent; Elkinton, Joseph S.; Wood, H. Alan; Podgwaite, John D.; McManus, Michael L.; Slavicek, James; Burand, John P. 1994. **A field test of genetically engineered gypsy moth NPV.** In: Kelley, Ronald S., comp. Proceedings of the combined meeting of the Northeastern Forest Pest Council and the 26th annual northeastern forest insect work conference; 1994 March 21-23; Manchester, NH. [Place of publication unknown]: [Publisher name unknown]: 14. Abstract.

Davidson, Walter H. 1994. **Hybrid pine for tough sites.** In: International land reclamation and mine drainage conference and 3rd international conference on the abatement of acidic drainage; 1994 April 24-29; Pittsburgh, PA. SP 06C-94. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines: 313-315.

deCalesta, David S. 1994. **Deer and diversity in Allegheny hardwood forests: managing an unlikely challenge.** Landscape and Urban Planning. 28: 47-53.

deCalesta, David S. 1994. **Deer density and ecosystems management.** In: The science of overabundance: the

ecology of unmanaged deer populations; 1994 November 10-11; Front Royal, VA. [Place of publication unknown]: [Publisher name unknown]: 6. Abstract.

deCalesta, David S. 1994. **Effect of white-tailed deer on songbirds within managed forests in Pennsylvania.** Journal of Wildlife Management. 58(4): 711-718.
The effects of four population levels of white-tailed deer in Pennsylvania were evaluated with respect to species richness, abundance, and habitat of songbirds. Varying deer density had no effect on ground- or upper canopy-nesting songbirds or their habitat, but species richness of intermediate canopy-nesting songbirds declined by 27 percent. Abundance declined by 37 percent between the lowest and highest deer densities.

deCalesta, David S.; McShea, William J. 1994. **Impacts of white-tailed deer on understory vegetation and faunal diversity in forest ecosystems of the eastern United States.** In: Excellence in wildlife stewardship through science and education: Abstracts of 1st annual conference of the wildlife society; 1994 September 20-25; Albuquerque, NM. [Place of publication unknown]: Wildlife Society: 22. Abstract.

Dennis, Donald F. 1994. **Assessing and incorporating extramarket values in decisions concerning forest ecosystems.** In: 1994 symposium on systems analysis in forest resources: management systems for a global economy with global resource concerns; 1994 September 6-9; Pacific Grove, CA. [Place of publication unknown]: [Publisher name unknown]: 4. Abstract.

Dennis, Donald F.; Tritton, Louise M.; Wang, Deane; Kuentzel, Walter. 1994. **Protecting wetlands for fishery management: an interdisciplinary evaluation.** In: Managing now for the 21st century: food, recreation and diversity: Proceedings, 124th annual meeting of the American Fisheries Society; 1994 August 21-25; Halifax, NS. [Place of publication unknown]: American Fisheries Society: 1. Abstract.

DiMascio, J. A.; Sweeney, P. M.; Danneberger, T. K.; Kamalay, J. C. 1994. **Analysis of heat shock response in perennial ryegrass using maize heat shock protein clones.** Crop Science. 34: 798-804.

Domir, Subhash C.; Schreiber, Lawrence R.; Eshita, Steven M. 1994. **Influence of coconut milk source on the host-pathogen interactions between *Ophiostoma ulmi* and Ulmus sections.** Journal of Arboriculture. 20 (5): 289-294.

Dubey, Tara; Stephenson, Steven L.; Edwards, Pamela J. 1994. **Effect of pH on the distribution and occurrence of aquatic fungi in six West Virginia mountain streams.** Journal of Environmental Quality. 23: 1271-1279.
Aquatic fungi in six streams located on or near the Fernow Experimental Forest in Tucker County, West Virginia, were studied during the 1991 and 1992 growing seasons. The number of taxa of hyphomycetes generally was lower in streams with low pH; however, fewest conidia were recorded at the two extremes of the pH gradient. Leaves of northern red oak were colonized by an average of 16 hyphomycete taxa in the six streams, sugar maple by 15.3 taxa, and mixed red maple and American beech by 15.2 taxa.

Dubois, N. R.; McLane, W.; Mierzejewski, K.; Reardon, R. C. 1994. **Effect of a commercial formulation of *Bacillus thuringiensis*, Foray 48B,R against late instar stages (III-IV) in a gypsy moth (*Lymantria dispar* L.) infestation.** In: Proceedings, 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: Gypsy Moth Management Board: 99-102.

Dubois, N. R.; Mierzejewski, K.; Reardon, R. C.; McLane, W.; Witcosky, J. J. 1994. ***Bacillus thuringiensis* field applications: effect of nozzle type, drop size, and application timing on efficacy against gypsy moth.** Journal of Environmental Science and Health. B29(4): 679-695.
The influence of delivery systems, drop size, and application timing on the efficacy of aerially applied *Bacillus thuringiensis* against gypsy moth infestations were evaluated. Use of different nozzle systems including Micronair, Flat Fan or Twin Jet, did not result in significant differences in Bt coverage efficiency, foliage protection, or population reduction, nor was there a significant difference in population reduction when Bt was applied at two drop sizes with volume median diameters of 110 and 163 µm.

Dubois, Normand; Montgomery, Michael. 1994. **U.S. scientists explore Europe.** Gypsy Moth News. 34: 5.

Edwards, Pamela Jean. 1994. **Sulfur-35 retention and movement in an Appalachain forest soil.** Raleigh, NC: North Carolina State University. 237p. Ph.D. dissertation.

Edwards, Pamela J.; Wood, Frederica. 1994. **Centroid lag time changes resulting from harvesting, herbiciding, and stand conversion.** In: Marston, Richard A.; Hasfurther, Victor, eds. Proceedings, annual summer symposium of the American Water Resources Association: Effects of human-induced changes on hydrologic systems; 1994 June 26-29; Jackson Hole, WY. Bethesda, MD: American Water Resources Association: 727-734.
In 1964, the lower half of a 22.2-ha mixed hardwood watershed in the central Appalachians was clearcut and maintained barren with herbicides until 1969. The upper half was clearcut in 1967-68 and also maintained barren until 1969. The watershed was planted to Norway spruce in 1973. Mean centroid lag times (CLT), i.e., difference in time between the centroid mass of precipitation and the centroid mass of stormflow, were calculated for the pretreatment and six treatment periods encompassing 34 years. Mean CLTs for this watershed were 2 times greater than those reported in previous studies.

Elkinton, J. S.; Liebhold, A. M. 1994. **The dynamics of gypsy moth predators, parasites, and pathogens.** Gypsy Moth News. 34: 9-11.

Ellsworth, D. S.; Tyree, M. T.; Parker, B. L.; Skinner, M. 1994. **Photosynthesis and water-use efficiency of sugar maple (*Acer saccharum*) in relation to pear thrips defoliation.** Tree Physiology. 14: 619-632.
An experimental introduction of pear thrips, a major defoliator in sugar maple in northeastern North America, was conducted in a field plantation to determine whether compensatory gas exchange occurs in response to feeding damage by this piercing-sucking insect. Pear thrips reduced whole-leaf area by approximately 23 percent and reduced leaf size (both mass and area) by 20 percent in the upper crown. Pear thrips feeding reduced the net CO_2 assimilation rate for fully expanded leaves by approximately 20 percent, though leaf chlorophyll content and leaf mass per unit area apparently were not affected.

Elmes, Gregory A.; Cai, Guoray; Twery, Mark J. 1994. **Estimating spatial data error by inference on a casual network.** In: Waugh, Thomas C.; Healey, Richard G., eds. 6th international symposium on spatial data handling: Advances in GIS research: Proceedings, vol. 1; 1994 September 5-9; Edinburgh, Scotland, UK. Edinburgh, Scotland, UK: International Geographical Union Commission on Geographic Information Systems: 254-276.

Engle, Catherine A.; West, Cynthia D.; Bush, Robert J. 1994. **The use of substitute material pallets by the grocery distribution industry.** Pallet Enterprise. 14(10): 24-26.

Ernst, Richard L. 1994. **Development of a silvicultural prescription.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 129-162.

Ernst, Richard L. 1994. **Distribution of cut under even-age management.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 289-321.

Eshita, S. M.; Koch, J. L.; Kamalay, J. C.; Schreiber, L. R. 1994. **Isolation and characterization of xylem proteins from American elm (*Ulmus americana* L.) inoculated with Dutch elm disease fungus *Ophiostoma ulmi*.** In: Applications of biotechnology to tree culture, protection, and utilization: proceedings of papers presented at the 2nd international symposium; 1994 October 2-6; Bloomington, MN. Gen. Tech. Rep. NC-175. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 28-29. Abstract.

Ferguson, C. S.; Elkinton, J. S.; Gould, J. R.; Wallner, W. E. 1994. **Population regulation of gypsy moth (Lepidoptera: Lymantriidae) by parasitoids: does spatial density dependence lead to temporal density dependence?** Environmental Entomology. 23(5): 1155-1164.

Fincher, James M.; Smith, Marie-Louise. 1994. **A discriminant function approach to ecological site classification in northern New England.** Res. Pap. NE-686. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 12 p.
Describes one approach to ecologically based classification of upland forest community types of the White and Green Mountain physiographic regions. The classification approach is based on an intensive statistical analysis of the relationship between the communities and soil-site factors. Discriminant functions useful in distinguishing between types based on soil-site factors most strongly correlated with their distribution over the landscape are presented.

Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. 1994. **Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994;** 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 97 p.
Contains 65 abstracts and papers of oral and poster presentations on gypsy moth biology, molecular biology, ecology, impacts, and management presented at the annual U.S. Department of Agriculture Interagency Gypsy Moth Research Forum.

Gansner, D. A.; Drake, D. A. 1994. **Defoliation potential of gypsy moth.** In: Foresters together: meeting tomorrow's challenges: proceedings of the 1993 Society of American Foresters national convention; 1993 November 7-10; Indianapolis, IN. SAF Publ. 94-01. Bethesda, MD: Society of American Foresters: 522-523.

Gansner, David A.; Arner, Stanford L.; Hershey, Rachel Riemann; King, Susan L. 1994. **Defoliation potential of gypsy moth.** In: Proceedings, 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 195-201.
Because levels of defoliation vary greatly within areas infested by the gypsy moth, practical methods for identifying locations most likely to suffer heavy defoliation during an infestation would greatly aid forest resource and pest managers. The development of a model that uses forest stand characteristics to estimate the likelihood of gypsy moth defoliation has resulted in susceptibility ratings and a map showing defoliation potential for counties in Pennsylvania and six surrounding states.

Gansner, David A.; Arner, Stanford L.; Widmann, Richard H.; Alerich, Carol L. 1994. **Are we butchering Penn's Woods?** Pennsylvania Forests. 85(3): 9-11.

Gansner, David A.; Arner, Stanford L.; Widmann, Richard H.; Alerich, Carol L. 1994. **Cutting disturbance in Pennsylvania; how much, where, and what.** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 37-41.

As part of the 1989 forest inventory in Pennsylvania, a network of about 2,000 permanent inventory plots was remeasured. For forest that remained in timberland, these plot records give a tree-by-tree history of removals for stems that were alive and 5 inches and larger in d.b.h. at the time of the previous inventory in 1978. These data provide an excellent opportunity to review cutting activity in the state.

Gansner, David A.; Arner, Stanford L.; Widmann, Richard H.; Alerich, Carol L. 1994. **What's happening to Pennsylvania's oak?** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 15-22.

Discusses stress experienced by Pennsylvania oak timber during past 20 years from gypsy moth defoliation, drought, cutting, deer browsing, and other factors. Data from 2,000 plots, shows trends in stocking of oak. Despite this damage, oak averages more than 400 cubic feet per acre of timberland in the Keystone State.

Gansner, David A.; Birch, Thomas W.; McWilliams, William H. 1994. **Central Appalachian hardwoods: recent trends in a robust resource.** In: Summer meeting of Appalachian Technical Division of the American Pulpwood Association; 1993 August 17; York, PA. Tech. Pap. 94-P-2. Washington, DC: American Pulpwood Association: 1-9.

Gansner, David A.; Quimby, John W.; King, Susan L.; Arner, Stanford L.; Drake, David A. 1994. **Tracking changes in the susceptibility of forest land infested with gypsy moth.** Res. Pap. NE-690. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

Garner, Karen J.; Slavicek, James M. 1994. **A nuclear DNA-based method for identifying Asian gypsy moths and Asian/North American gypsy moth hybrids.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 23. Abstract.

Gatchell, Charles J.; Thomas, R. Edward; Walker, Elizabeth S. 1994. **AGARIS: Advanced GAng Ripping Simulator.** In: Forest Products Society 48th annual meeting: bibliographies and abstracts; 1994 June 26-29; Portland, ME. Madison, WI; Forest Products Society: 35. Abstract.

Gentry, Claude E.; Walton, Gerald S.; Davidson, Walter H.; Wade, Gary L. 1994. **Influences of humic and fulvic acids and organic matter on leachate chemistry from acid coal spoil.** In: International land reclamation and mine drainage conference and 3rd international conference on the abatement of acidic drainage; 1994 April 24-29; Pittsburgh, PA. SP 06C-94. Pittsburgh, PA: U.S. Department of the Interior, Bureau of Mines: 166-174.

Column-leaching experiments were conducted on an acid pyritic coal spoil in Lily, Kentucky, to determine the influence of acid rain, humic acid (HA), fulvic acid (FA), and undecomposed organic matter (OM) on pH and Al, Fe, Mn, and SO_4 concentrations in the spoil leachate and on the spoil. Adding HA and tall fescue leaf material created a longer lasting desirable effect on leachate pH and Al, Fe, Mn, and SO_4 than additions of FA or OM of five other species. Revegetation resulting in rapid production of matured soil OM may reduce the amount of some ions commonly leached from acid mine spoils.

Gilliam, Frank S.; Turrill, Nicole L.; Aulick, Staci D.; Evans, Dan K.; Adams, Mary Beth. 1994. **Herbaceous layer and soil response to experimental acidification in a Central Appalachian hardwood forest.** Journal of Environmental Quality. 23(4): 835-844.

Gingas, V. M.; Domir, S. C.; Kamalay, J. C. 1994. **Optimization of *Ulmus* suspension cultures for elicitor/phytoalexin experiments.** In: HortScience. 29(5): 433. Abstract.

Gingas, V. M.; Kamalay, J. C. 1994. **Optimization of elm suspension cultures for elicitor/phytoalexin experiments.** In: Applications of biotechnology to tree culture, protection, and utilization: proceedings of papers presented at the 2nd international symposium; 1994 October 2-6; Bloomington, MN. Gen. Tech. Rep. NC-175. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 62. Abstract.

Glass, Ronald J.; More, Thomas A. 1994. **Conflicts between angler motivations and public acceptance of sport fishing.** In: Managing now for the 21st century: food, recreation and diversity: proceedings, 124th annual meeting of the American Fisheries Society; 1994 August 21-25; Halifax, NS. [Place of publication unknown]: American Fisheries Society: 2. Abstract.

Glass, Ronald J.; More, Thomas A.; Stevens, Thomas H. 1994. **Integrating public values into wildlife management.** In: Thompson, Ian D., ed. Forests and wildlife: towards the 21st century: proceedings of the International Union of Game Biologists 21st congress; 1993 August 15-20; Halifax, NS. Chalk River, ON: Canadian Forestry Service: 181-188.

For most situations in North America, both consumptive and nonconsumptive wildlife uses fall into the realm of merit or social goods. As such, they are not expressed by traditional market-oriented monetary measures. The measurement of associate values is difficult and challenging. These extra-market values include option and existence values, the latter related to altruistic, intrinsic, and ethical concerns.

Gottschalk, Kurt W.; MacFarlane, W. Russ. 1994. **Using silviculture to increase forest health: a national forest/research/state and private demonstration area.** In: Foley, Louise H., comp. Silviculture: from the

cradle of forestry to ecosystem management: proceedings of the national silviculture workshop; 1993 November 1-4; Hendersonville, NC. Gen. Tech. Rep. SE-88. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 132-136.

Gove, Jeffrey H. 1994. **Geostatistical modeling of tree crown shape.** In: Rennolls, Keith, ed. Stochastic spatial models in forestry: proceedings of a IUFRO S4.11 conference; 1993 May 18-21; Thessaloniki, Greece. Greenwich, UK: University of Greenwich: 7-17.

Gove, Jeffrey H.; Fairweather, Stephen E.; Solomon, Dale S. 1994. **Optimizing the horizontal structural diversity in uneven-aged northern hardwood stands.** Environmental and Ecological Statistics. 1: 109-120.
Two mathematical programming formulations are presented that allow the determination of diameter distributions which 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. The models provide an initial framework for addressing diversity requirements of the U.S. National Forest Management Act.

Gove, Jeffrey H.; Patil, Ganapati P.; Swindel, Benee F.; Taillie, Charles. 1994. **Ecological diversity and forest management.** In: Patil, G. P.; Rao, C. R., comps., eds. Handbook of statistics. Vol. 12. Amsterdam, The Netherlands: Elsevier Science: 409-462.
The diversity of an ecological community is defined in terms of the average species rarity of that community using both dichotomous-a and rank-type rarity measures. Common diversity indices and profiles were developed using this definition. The concept of intrinsic diversity ordering is described.

Grant, Richard H.; Heisler, Gordon M. 1994. **The design of a low powered ventilated radiation shield.** In: Proceedings, 21st conference on agricultural and forest meteorology; 1994 March 7-10; San Diego, CA. Boston, MA: American Meteorological Society: 203-206.

Griffith, Douglas M.; Wharton, Eric H. 1994. **Ohio's forests, looking good—but.** Ohio Woodlands. 31(2): 20-21.

Grimmond, Sue; Souch, Catherine; Grant, Richard; Heisler, Gordon. 1994. **Local scale energy and water exchanges in a Chicago neighborhood.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 41-61.
Outlines methods of analysis of "above ground" meteorological measurements for investigating the nature of surface controls on energy and water exchanges at the local scale. Observations were made over "intensive" and "extensive" periods. During the intensive period, vertical fluxes of sensible and latent heat were measured by eddy correlation methods at one above-canopy site. By combining these with measurements of net radiation and storage heat flux and detailed characterization of urban surface materials and morphology, a general understanding of energy exchanges of the urban surface at the local scale (100 to 1,000 m) was obtained.

Hansen, Bruce G. 1994. **Japanese hardwood product imports: current situation and historic trends.** In: The globalization of wood: supply, processes, products, and markets: Proceedings of a conference; 1993 November 1-3; Portland, OR. Madison, WI: Forest Products Society: 184-187.

Harris, M. M.; Safford, L. O. 1994. **Effects of microwave drying on exchangeable cations in forest soils.** Soil Science. 157(4): 232-237.
Brief drying times for soil samples are sometimes necessary, for example, to halt microbial activity or to estimate the fresh weight of soil needed to provide a particular dry weight for incubation or other experiments. The effects of air, conventional, and microwave drying on soil chemical properties were compared. There were no significant differences between mean values determined for levels of various exchangeable cations or pH for field moist samples or any of the drying methods.

Hastings, F. L.; Hain, F. P.; Smith, H. R.; ODell, T. M.; Cook, S. P. 1994. **Natural enemies of the gypsy moth at the leading edge of its invasion into the southern U.S.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 28. Abstract.

Healy, William M. 1994. **Ecosystem management: policies and procedures for effective implementation in the Northeast.** Northeast Wildlife. 51: 81-89.

Heisler, Gordon, M.; Grimmond, C. S. B.; Grant, Richard H.; Souch, Catherine. 1994. **Modeling tree and building effects on microclimate in residential areas.** In: Abstracts of 90th annual meeting of Association of American Geographers; 1994 March 28-April 2; San Francisco, CA. Washington, DC: American Association of Geographers: 151. Abstract.

Heisler, Gordon M.; Grimmond, Sue; Grant, Richard H.; Souch, Catherine. 1994. **Investigation of the influence of Chicago's urban forests on wind and air temperature within residential neighborhoods.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 19-40.
Researchers are examining the degree to which climate that surrounds people and houses in residential neighborhoods in Chicago and adjacent communities is influenced by trees.

The general research approach is to use windspeed, air temperature, and humidity at the nearest airport as reference conditions to compare differences in these climate variables between points in residential neighborhoods.

Hiremath, S.; Lehtoma, K.; Nagarajan, M. 1994. **cDNA cloning and expression of the large subunit of juvenile hormone-regulated vitellogenin from *Lymantria dispar*.** Journal of Insect Physiology. 40(9): 813-831.
The 5.4-kb RNA enriched in mRNA coding for the large subunits of vitellogenin (VgL mRNA) in the gypsy moth was purified and used to construct a cDNA library. One of the clones, pVL-80, had sequences representing an internal region of VgL mRNA. The cDNA representing the 5'-terminal region of VgL mRNA was isolated by 5'-RACE (Rapid Amplification of cDNA Ends) and found to contain sequences encoding the N-terminal amino acid sequence of Vg 190. The insert in pVL-80 was 822 bp long and had an open reading frame (ORF) extending beyond the insert in both directions. In vitro expression of the ORF produced a 32-kDa protein which reacted with Vg 190 antiserum.

Hiremath, Shiv; Podila, G. K. 1994. **Biological control of white grubs by genetically-engineered ectomycorrhizal fungi.** In: Applications of biotechnology to tree culture, protection, and utilization: proceedings of papers presented at the 2nd international symposium; 1994 October 2-6; Bloomington, MN. Gen. Tech. Rep. NC-175. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 68-69. Abstract.

Hiremath, Shivanand; Lehtoma, Kirsten. 1994. **Characterization of the gene encoding the large subunit of vitellogenin from the gypsy moth.** The FASEB Journal. 8(7): A1441. Abstract.

Hiremath, Shivanand; Lehtoma, Kirsten. 1994. **Cloning and characterization of a cDNA encoding the small subunit of vitellogenin from the gypsy moth.** Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 29. Abstract.

Hiremath, Shivanand; Lehtoma, Kirsten. 1994. **Genetic control of the gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 30. Abstract.

Hollinger, D. Y.; Kelliher, F. M.; Byers, J. N.; Hunt, J. E.; McSeveny, T. M.; Weir, P. L. 1994. **Carbon dioxide exchange between an undisturbed old-growth temperate forest and the atmosphere.** Ecology. 75(1): 134-150.
The eddy-correlation technique was used to investigate the exchange of CO_2 between an undisturbed old-growth forest and the atmosphere at a remote Southern Hemisphere site. On clear summer days, the maximum rate of net ecosystem CO_2 uptake exceeded 15 $\mu mol/m^2/s^{-1}$, about an order of magnitude greater than the maximum values observed on sunny days in the winter. Mean nighttime respiration rates ranged from -1 to -7 $\mu mol/m^2/s^{-1}$.

Hollinger, D. Y.; Kelliher, F. M.; Schulze, E. D.; Kostner, B. M. M. 1994. **Coupling of tree transpiration to atmospheric turbulence.** Nature. 371(6492): 60-62.
Understanding mass and energy exchange between vegetation and the atmosphere is essential in determining the future state of the climate system and responses of plant communities. Plant water use currently is described by steady-state transport models even though transport in the boundary layer is turbulent. This is especially true for forests, where the canopy air space is a chaotic environment where large turbulent events alternate with smaller scale mixing. The effect of the turbulent nature of the atmosphere on plant processes is demonstrated.

Horsley, Stephen B. 1994. **Deer density effects on pin cherry in Allegheny hardwood clearcuts.** In: Neal, J. C., ed. Proceedings of the 48th annual meeting of the Northeastern Weed Science Society; 1994 January 3-6; Baltimore, MD. Ithaca, NY: Northeastern Weed Science Society: 41. Abstract.

Horsley, Stephen B. 1994. **Regeneration success and plant species diversity of Allegheny hardwood stands after Roundup application and shelterwood cutting.** Northern Journal of Applied Forestry. 11(4): 109-116.
The presence of desirable regeneration and plant species diversity was studied in five Allegheny hardwood stands before and for 7 years after application of Roundup herbicide and shelterwood cutting to remove interfering understories of hayscented and New York fern, striped maple, and beech, and to establish desirable hardwood regeneration.

Horsley, Stephen B.; Auchmoody, L. R.; Walters, Russell S. 1994. **Regeneration principles and practices.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 205-246.

Houston, D. B.; Houston, D. R. 1994. **Variation in American beech (*Fagus grandifolia* Ehrh.): isozyme analysis of genetic structure in selected stands.** Silvae Genetica. 45(5/8): 277-284.
The genetic structure of *Fagus grandifolia* Ehrh. stands in Massachusetts (MA) and West Virginia was studied by analysis of isozyme variation at nine loci. The stands were substructured into mosaics of putative clones and trees of seedling origin. The level of genetic diversity was high: observed per-locus heterozygosities averaged 0.382; the number of alleles per locus averaged 2.9. Significant deviations from Hardy-Weinberg equilibrium were detected for up to five of the nine loci studied. Deviations resulted

from an excess of heterozygotes at the 6PG-2, MDH-1, and CTO-1 (MA only) loci, and a deficiency of heterozygotes at the CTO-2 and PER-3 loci.

Houston, D. R. 1994. **Major new tree disease epidemics: beech bark disease.** Annual Review of Phytopathology. 32: 75-87.
The patterns of the spread and development of the causal agents of beech bark disease in North America are discussed.

Houston, David R. 1994. **Beech bark disease.** In: Kelley, Ronald S., comp. Proceedings of the combined meeting of the Northeastern Forest Pest Council and the 26th annual northeastern forest insect work conference; 1994 March 21-23; Manchester, NH. [Place of publication unknown]: [Publisher name unknown]: 35-36.

Houston, David R. 1994. **Sapstreak disease of sugar maple: development over time and space.** Res. Pap. NE-687. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 19 p.
Sapstreak disease, a potentially serious problem of sugarbushes and forest stands, is caused by the fungus *Ceratocystis virescens*, which invades sapwood of roots and bases of stems through wounds created during logging, saphauling, or other activities. The results of observations and experiments to learn more about the patterns of disease development and the factors that affect them are presented.

Houston, David R. 1994. **Temporal and spatial shift within the *Nectria* pathogen complex associated with beech bark disease of *Fagus grandifolia*.** Canadian Journal of Forest Research. 24: 960-968.
Beech bark disease occurs when *Nectria galligena* Bres. or *Nectria coccinea* var. *faginata* Lohman, Watson, and Ayers kills bark that is or has been infested and altered by the beech scale *Cryptococcus fagisuga* (Lind.). Introduced to Nova Scotia around 1890, this insect now is found as far southwest as Ohio, West Virginia, Virginia, and North Carolina. The relative occurrence of the two pathogens in forests affected for varying times and temporal changes and in recently affected stands of the Monongahela National Forest in West Virginia is discussed.

Huyler, Neil K.; [Aiken, George D.]; LeDoux, Chris T. 1994. **Residual stand damage survey for three small tractors used in harvesting northern hardwoods.** In: Sessions, John; Kellogg, Loren, eds. Proceedings of meeting on advanced technology in forest operations: applied ecology in action; 1994 July 24-29; Portland/ Corvallis, OR. Corvallis, OR: Oregon State University, Department of Forest Engineering: 173-183.
Reports on residual stand damage and logging-residue analysis for three ground-based, small-scale harvesting machines that were used to conduct low thinnings on the Harvard Black Rock Forest in Cornwall, New York.

Huyler, Neil K.; Williams, Sumner. 1994. **Maple syrup production cost 1994 update.** Maple Syrup Digest. 6A(3): 10-12.

Iverson, Louis R. 1994. **Forest resource trends in Illinois.** Erigenia. 13: 4-19.
Focuses on current trends in Illinois forests and reports information obtained following earlier studies, specifically, changes in forest cover from 1820 to 1985, current (1990) trends and patterns of forest land for a portion of south-central Illinois, and trends in forest composition and diversity, timber growth and harvest, value for wildlife habitat, and value for carbon sequestration.

Iverson, Louis R. 1994. **The Illinois Plant Information Network: an information database for regional analysis of vascular plant biodiversity.** In: Science and public policy: program and abstracts. Part two: abstracts of 79th annual ESA meeting; 1994 August 7-11; Knoxville, TN. Supplement to Bulletin of the Ecological Society of America. 75(2): 104-105. Abstract.

Iverson, Louis R.; Brown, Sandra; Grainger, Alan. 1994. **Estimating carbon stocks and potential for new carbon sequestration in forests of tropical Asian landscapes.** In: Foresters together: meeting tomorrow's challenges: proceedings of the 1993 Society of American Foresters national convention; 1993 November 7-10; Indianapolis, IN. SAF Publ. 94-01. Bethesda, MD: Society of American Foresters: 207-209.
A geographic information system approach was used to estimate carbon stocks potentially and actually in 1980, as well as the technical suitability for enhancing carbon sequestration in above-ground forest biomass of South and Southeast Asia.

Iverson, Louis R.; Brown, Sandra; Grainger, Alan; Prasad, Anantha; Liu, Dawning. 1994. **Carbon sequestration in tropical Asia: an assessment of technically suitable forest lands using geographic information systems analysis.** Climate Research. 3: 23-38.

Iverson, Louis R.; Brown, Sandra; Prasad, A. 1994. **Estimating potential tropical forest biomass over South/Southeast Asia.** In: Gillespie, A. J. R., comp. Remote sensing for tropical forest assessment: evaluacion de bosques tropicales utilizando la tecnica telesensorial: proceedings of a workshop; 1991 April 8-10; San Juan, PR. Gen. Tech. Rep. SO-113. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station: 24.

Iverson, Louis R.; Brown, Sandra; Prasad, Anantha; Mistosova, Helena; Gillespie, Andrew J. R.; Lugo, Ariel E. 1994. **Use of GIS for estimating potential and actual forest biomass for continental South and Southeast Asia.** In: Dale, Virginia H., ed. Effects of land-use change on atmospheric CO_2 concentrations. New York: Springer-Verlag: 67-116.
A geographic information system (GIS) was used to estimate total biomass and biomass density of the tropical forests in South and Southeast Asia because available data from forest inventories were insufficient to extrapolate biomass-density estimates across the region. Initially, the biomass density that would be expected if no humans or natural disturbances were present was modeled. This value

was derived from GIS data layers on elevation, soils, slope, precipitation, and an integrated climate index.

Iverson, Louis R.; Cook, Elizabeth A.; Graham, Robin L. 1994. **Regional forest cover estimation via remote sensing: the calibration center concept.** Landscape Ecology. 9(3): 159-174.
Describes a method for combining the Landsat Thematic Mapper, Advanced Very High Resolution Radiometer imagery, and other biogeographic data to estimate forest cover over large regions.

Iverson, Louis R.; Graham, Robin L.; Cook, Elizabeth A. 1994. **Methodological aspects of using AVHRR data: calibrating AVHRR data with Landsat.** In: Gillespie, A. J. R., comp. Remote sensing for tropical forest assessment: evaluacion de bosques tropicales utilizando la tecnica telesensorial: proceedings of a workshop; 1991 April 8-12; San Juan, PR. Gen. Tech. Rep. SO-113. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station: 20-21.

Iverson, Louis R.; Schwartz, Mark W. 1994. **Forests.** In: Ballenot, John P., tech. ed. The changing Illinois environment: critical trends. Technical report of the critical trends assessment project. Volume 3: ecological resources. ILENR/RE-EA-94/05(3). Springfield, IL: Illinois Department of Energy and Natural Resources: 33-66.

Jagels, Richard; Hornbeck, James; Marden, Susan. 1994. **Drought and cold stress-induced morphometric changes in tree rings of red spruce.** Tech. Bull. 159. Orono, ME: University of Maine, Maine Agricultural and Forest Experiment Station. 19 p.

Kamalay, J. C.; Carey, D. W.; Schreiber, L. R.; Cheng, Z. M. 1994. **Genetic diversity in American elms (*Ulmus americana* L.).** In: Applications of biotechnology to tree culture, protection, and utilization: proceedings of papers presented at the 2nd international symposium; 1994 October 2-6; Bloomington, MN. Gen. Tech. Rep. NC-175. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 71-72. Abstract.

Keena, M. A. 1994. **Identification of gypsy moth larval color forms.** NE/NA-INF-123-94. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station and Northeastern Area, State and Private Forestry. 2 p.

Keena, Melody. 1994. **Genetics and biology of Asian gypsy moth and its hybrids.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 32. Abstract.

Keena, Melody A. 1994. **Genetics of diapause in the gypsy moth: a review.** In: Logan, Jesse A.; ODell, Thomas M.; Gray, David R., eds. Diapause and gypsy moth management: status, applications, and research; 1991 October 2-3; Blacksburg, VA. Gen. Tech. Rep. NE-193. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 89-97.
Literature on the inheritance of diapause characteristics in the gypsy moth is reviewed and discussed. The inheritance of three traits associated with diapause or post-diapause have been examined: (1) the number of days from egg laying to first hatch; (2) the number of days from the end of chill to the beginning of hatch (incubation time); and (3) duration of the hatch period in days. Days to first hatch appeared to be sex linked. Work with several geographic races suggest that both incubation time and duration of hatch are polygenetically inherited.

Keena, Melody A. 1994. **Laboratory research on the Asian race of the gypsy moth.** In: Kuharic, Kathryn E., comp. Proceedings, 1993 annual gypsy moth review; 1993 November 1-4; Harrisburg, PA. [Place of publication unknown]: National Gypsy Moth Management Board: 34-36.

Keena, Melody A.; ODell, Thomas M. 1994. **Effects of laboratory testing on the gypsy moth (Lepidoptera: Lymantriidae).** Gen. Tech. Rep. NE-181. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 23 p.
The history and performance of the New Jersey Standard Strain (NJSS) of the gypsy moth, since its establishment in the laboratory in 1967 are reviewed. Phenotypic changes in the NJSS during and after 35 generations of domestication are defined quantitatively and qualitatively. The use of NJSS for research and development should be assessed carefully relative to the reported effects of domestication and need to equate the performance of NJSS to a specific research/development objective.

Kidd, William E., Jr.; Smith, H. Clay. 1994. **Woodlot management: harvesting and renewing it.** Morgantown, WV: West Virginia University Cooperative Extension Service. 20 p.

Kleiner, Karl W.; Montgomery, Michael E. 1994. **Forest stand susceptibility to the gypsy moth (Lepidoptera: Lymantriidae): species and site effects on foliage quality to larvae.** Environmental Entomology. 23(3): 699-711.
In the Northeast, forest stands on xeric sites such as ridgetops and steep upper slopes generally experience more gypsy moth defoliation than those on mesic lowland sites. To determine whether foliage quality from a site can contribute to forest stand susceptibility, gypsy moth larvae were reared on chestnut oak and northern red oak foliage collected from two xeric and two mesic forest sites. Chestnut oak foliage had greater measures of phenolics than red oak and produced heavier male and female pupae and more fecund females. Foliage from xeric sites was likely to have greater measures of phenolics, but only male pupal weights were greater for larvae reared on xeric-site foliage.

Kline, D. Earl; Sarin, Subhash C.; Brisbin, Robert L. 1994. **Improving the performance of furniture manufacturing using systems simulation.** In: Forest Products Society 48th annual meeting: bibliographies and abstracts; 1994 June 26-29; Portland, ME. Madison, WI: Forest Products Society: 58. Abstract.

Klinkhachorn, Powsiri; Gatchell, Charles J.; Moody, John. 1994. **UGRS: the Ultimate Grading and Remanufacturing System.** In: Forest Products Society 48th annual meeting: bibliographies and abstracts; 1994 June 26-29; Portland, ME. Madison, WI: Forest Products Society: 34. Abstract.

Klinkhachorn, Powsiri; Gatchell, Charles J.; Moody, John. 1994. **User's guide to ReGS: a realistic grading system (version 2.24).** Gen. Tech. Rep. NE-190. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 32 p.
The Realistic Grading System (ReGS) is an interactive, computer-based training tool designed to teach hardwood lumber graders in accordance with National Hardwood Lumber Association rules. The ReGS program can consider 10 types of defects, display either board face while grading, and zoom into 4-foot sections of the board. ReGS also includes on-screen rulers that measure the defect and board dimensions.

Koch, J. L.; Eshita, S. M.; Wilson, A. D. 1994. **Development of PCR-based assays to detect *Ceratocystis fagacearum* at the species and strain levels.** In: Applications of biotechnology to tree culture, protection, and utilization: proceedings of papers presented at the 2nd international symposium; 1994 October 2-6; Bloomington, MN. Gen. Tech. Rep. NC-175. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 75-76. Abstract.

Kohl, Michael; Scott, Charles T.; Zingg, Andreas. 1994. **Permanent monitoring plots: potential and limitations.** In: Innes, John L., ed. Assessment of increment in permanent monitoring plots established to determine the effects of air pollution on forests: proceedings of the Sopron workshop; 1993 August 28-September 1; Sopron, Hungary. Birmensdorf, Switzerland: Swiss Federal Institute for Forest, Snow and Landscape Research: 17-24.
Forest health monitoring can be based on assessments on sample survey (ECE Level I) and permanent monitoring (ECE Level II) plots. The difference in research objectives leads to a situation where sample plots are available that are representative of the total population but give only limited information on site conditions and management history. Detailed information on site condition and management history is available for monitoring plots, but these do not represent the total population. The role of permanent monitoring plots in causal inference is discussed.

Kohl, Von M.; Scott, Ch. T. 1994. **Zur auswertung von gruppenstichproben bei extensiven forstinventuren (Analysis of cluster sampling in extensive forest surveys).** Allgemeine Forst-und Jagdzeitung. 164(5-6): 101-106.

Kohl, Von Michael; Scott, Charles T.; Brassel, Peter. 1994. **Zweites Schweizerisches Landesforstinventar: optimierung des stichprobenplanes unter dem gesichtspunkt der Kosteneffizienz.** Schweizerische Zeitschrift fuer Forstwesen. 145(9): 721-738.

Krider, Hallie M.; Shields, Kathleen S. 1994. **Developmental genetics of *Lymantria dispar*.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 33-34. Abstract.

Kuenen, L. P. S.; Wagner, D. L.; Wallner, W. E.; Carde, R. T. 1994. **Female sex pheromone in *Korscheltellus gracilis* (Grote) (Lepidoptera: Hepialidae).** Canadian Entomologist. 126: 31-41.

Kwak, I. S.; Liebig, B.; Stetson, D.; Dean, D. H.; Dubois, N. R. 1994. **Preliminary results on the effects of iron bioavailability on toxicity, electrophysiological and binding characteristics of *Bacillus thuringiensis* on *Lymantria dispar* L.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 35. Abstract.

Leak, Bill. 1994. **Silvicultural principles for New England forest types.** Durham, NH: University of New Hampshire, Cooperative Extension. 15 p.

Leak, William B.; Yamasaki, Mariko; Smith, Marie-Louise; Funk, David T. 1994. **Selection criteria for forested natural areas in New England, USA.** Natural Areas Journal. 14(4): 300-305.
The selection of forested natural areas for research and educational purposes is discussed. Five factors are important: sufficient size; representation of typical communities and sites; documented disturbance histories; acceptable current condition in terms of age, tree size, and successional stage; and administrative feasibility.

LeDoux, Chris B.; Baumgras, John E.; Sherar, James. 1994. **Comparison of contemporary cable harvesting practices for eastern hardwoods on steep slopes.** In: Sessions, John; Kellogg, Loren, eds. Proceedings of meeting on advanced technology in forest operations: applied ecology in action; 1994 July 24-29; Portland/ Corvallis, OR. Corvallis, OR: Oregon State University, Department of Engineering: 155-166.

Lefohn, Allen S.; Edwards, Pamela J.; Adams, Mary Beth. 1994. **The characterization of ozone exposures in rural West Virginia and Virginia.** Journal of Air & Waste Management Association. 44: 1276-1283.

Lewis, Ann M.; Hamden, Virginia D.; Tyree, Melvin T. 1994. **Collapse of water-stress emboli in the tracheids of *Thuja occidentalis* L.** Plant Physiology. 106: 1639-1646.
Reports on the kinetics of embolus formation and collapse in the tracheids of stem segments of northern white-cedar.

Liang, Y.; Dean, D. H.; Dubois, N. R. 1994. **Location of the *Lymantria dispar* L. region of *Bacillus thuringiensis* CryIIA delta-endotoxin.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 37. Abstract.

Liebhold, A. M. 1994. **Use and abuse of insect and disease models in forest pest management: past, present, and future.** In: Covington, W. Wallace; DeBano, Leonard F., tech. coords. Sustainable ecological systems: implementing an ecological approach to land management; 1993 July 12-15; Flagstaff, AZ. Gen. Tech. Rep. RM-247. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 204-210.

Liebhold, Andrew. 1994. **Review of "Analytical population dynamics".** American Entomologist. 40(2): 113.

Liebhold, Andrew. 1994. **The state of the art in gypsy moth egg mass sampling or lack thereof.** In: Proceedings, 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 68-72.

Liebhold, Andrew M.; Elmes, Gregory A.; Halverson, Joel A.; Quimby, John. 1994. **Landscape characterization of forest susceptibility to gypsy moth defoliation.** Forest Science. 40(1): 18-29.

Liebhold, Andrew; Thorpe, Kevin; Ghent, John; Lyons, D. Barry. 1994. **Gypsy moth egg mass sampling for decision-making: a user's guide.** NA-TP-04-94. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry and Southern Region. 12 p.

Liebhold, Andrew; Zhou, Guofa; Gottschalk, Kurt; Gansner, David; Amer, Stan. 1994. **Using forest inventory and analysis data to predict susceptibility to gypsy moth defoliation.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 38-39. Abstract.

Liebhold, Andrew; Zhou, Guofa; Gribko, Linda; Hohn, Michael. 1994. **How to use your GIS to predict gypsy moth defoliation.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 40. Abstract.

Lindroth, Richard L.; Hwang, Shaw Y.; Montgomery, Michael E.; Shields, Kathleen S. 1994. **Effects of aspen chemistry on gypsy moth susceptibility to *Bt*.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 41. Abstract.

Logan, Jesse A.; ODell, Thomas M.; Gray, David R., eds. 1994. **Diapause and gypsy moth management: status, applications, and research**; 1991 October 2-3; Blacksburg, VA. Gen. Tech. Rep. NE-193. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 97 p.
Presents papers from a 3-day workshop designed to: facilitate communication between research scientists working on various aspects of gypsy moth diapause; allow individual scientists the opportunity to present recent results in gypsy moth diapause research; and identify future research needs and priorities.

Long, R. P.; Horsley, S. B.; Lilja, P. 1994. **Impact of forest liming on growth and vigor of Allegheny hardwoods.** In: Air pollution & multiple stresses: 16th international meeting for specialists in air pollution effects on forest ecosystems; 1994 September 7-9; Fredericton, NB. [Place of publication unknown]: [Publisher name unknown]. 38. Abstract.

Long, R. P.; Weidensaul, T. C.; Capek, C. L. 1994. **Maple health and nutrient status in Ohio's sugarbushes.** Phytopathology. 84(5): 545. Abstract.

Long, Robert P.; McClenahen, James R.; Davis, Donald D.; Lynch, James A.; Skelly, John M.; Martin, Juri. 1994. **Oak-history forest condition along an atmospheric deposition gradient in Pennsylvania.** In: Mid-Atlantic highlands area environmental monitoring and assessment conference: abstract booklet; 1994 February 23-25; Hershey, PA. [Place of publication unknown]: U.S. Environmental Protection Agency, Office of Research and Development: 28. Abstract.

Long, Robert P.; Weidensaul, T. C.; Capek, C. L. 1994. **Maple health status in Ohio sugarbushes.** Ohio Journal of Science. 94(2): 22-23.

Lown, Joel B.; Prather, Timothy G.; Peters, Penn A. 1994. **Multimedia training for loggers, arborists, and woodcutters.** ASAE-937523. St. Joseph, MI: American Society of Agricultural Engineers. 6 p.

Luo, Y.; Miller, D. R.; McManus, M. L.; Krider, H. M. 1994. **Spray droplet evaporation rates: Bt, Dimilin and water.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994: 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U. S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 80. Abstract.

Luo, Y.; Miller, D. R.; Yang, X.; McManus, M. L.; Krider, H. M. 1994. **Characteristics of evaporation from water-based bacterial pesticide droplets.** Transactions of the ASAE. 37(5): 1473-1479.

Luppold, William G. 1994. **Are perceived shortages of hardwood timber real?** Northern Logger. (September): 12-14.
The hardwood industry has become increasingly concerned over the availability of higher quality logs of the more desired species, particularly in the Northeastern and North-central United States. However, USDA Forest Service statistics suggest that inventories of quality hardwood sawtimber in these regions are increasing. The apparent contradiction between industry's concerns and Forest Service data is discussed.

Luppold, William G. 1994. **The U.S. hardwood log export situation: what is the problem?** Forest Products Journal. 44(9): 63-67.
The export of domestically produced hardwood logs continues to be a divisive issue within the U.S. hardwood industry. Although many sawmill and veneer mill operators believe log exports have pushed log prices to unacceptable levels, others within the industry believe logs should continue to be sold to the highest bidder. Hardwood log exports are discussed in the context of changes in exports and factors that have caused these changes.

Luppold, William G.; Dempsey, Gilbert P. 1994. **Factors affecting regional changes in hardwood lumber production.** Forest Products Journal. 44(6): 8-14.

Luppold, William G.; Smith, Paul; Haas, Michael P. 1994. **Should the furniture industry be concerned about using imported tropical wood products?** Wood & Wood Products. (July): 267-268.
The United States accounts for only a small part of the global trade of tropical timber products. In 1989, U.S. imports of this material made up 4 percent of the total volume of tropical timber traded. There is little evidence to suggest that this percentage has increased during this decade.

Lynch, James A.; Horner, Kevin S.; Grimm, Jeffrey W.; Corbett, Edward S. 1994. **Atmospheric deposition: spatial and temporal variations in Pennsylvania - 1993.** University Park, PA: The Pennsylvania State University, Environmental Resources Research Institute. 398 p.

Lynch, James A.; Horner, Kevin S.; Grimm, Jeffrey W.; Corbett, Edward S. 1994. **Atmospheric deposition: spatial and temporal variations in Pennsylvania - 1993.** University Park, PA: The Pennsylvania State University, Environmental Resources Research Institute; ER9407. 89 p.

Lyons, D. Barry; Liebhold, Andrew. 1994. **Microclimate effect on the phenology of egg hatch of the gypsy moth, *Lymantria dispar* (Lepidoptera: Lymantriidae).** In: Logan, Jesse A.; ODell, Thomas M.; Gray, David R., eds. Diapause and gypsy moth management: status, applications, and research; 1991 October 2-3; Blacksburg, VA. Gen. Tech. Rep. NE-193. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 27-40.
Simulation of the phenology of egg hatch of gypsy moth indicates that substrate temperature and microhabitat distribution of egg masses affect predictions of hatch phenology. The influence of the egg mass position on tree boles on hatching time was investigated at field sites in Ontario and Pennsylvania. Female gypsy moths deposited egg masses predominantly on the eastern side of tree boles but hatch was most advanced in masses on southern sides. There was a weak relationship between height on the tree bole and rate of egg hatch but not on the lower portion of the bole.

Machado, Jose-Luis; Tyree, Melvin T. 1994. **Patterns of hydraulic architecture and water relations of two tropical canopy trees with contrasting leaf phenologies: *Ochroma pyramidale* and *Pseudobomabax septenatum*.** Tree Physiology. 14: 219-240.

Marquis, David A. 1994. **History and origin of Allegheny hardwoods.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 5-40.

Marquis, David A., ed. 1994. **Quantitative silviculture for hardwood forests of the Alleghenies.** Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 376 p.
Includes lectures from the annual silviculture training sessions designed to explain and demonstrate the silvicultural prescription system to practicing foresters.

Marquis, David A. 1994. **SILVAH computer analysis.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 163-203.

Marquis, David A. 1994. **Summary.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 367-376.

Marquis, David A. 1994. **Thinning principles and practices: control of stand density, structure, and species composition during thinning in hardwood stands in the Alleghenies.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. U.S. Radnor, PA: Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 247-288.

Marquis, David A.; Cochran, Roe S. 1994. **Introduction.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep, NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 1-4.

Marquis, David A.; Twery, Mark J. 1994. **Decision-making for natural regeneration in the northern forest ecosystem.** In: Loftis, David L.; McGee, Charles E., eds. Oak regeneration: serious problems practical recommendations: symposium proceedings; 1992 September 8-10; Knoxville, TN. Gen. Tech. Rep. SE-84. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 156-171.

Martin, C. Wayne; Hornbeck, James W. 1994. **Logging in New England need not cause sedimentation of streams.** Northern Journal of Applied Forestry. 11(1): 17-23.

Erosion, sedimentation, and turbidity can be controlled during and after logging in New England forests by conscientiously following regulations and guidelines known as Best Management Practices. This is demonstrated by comparing sediment yields and stream turbidities from cut and uncut watersheds at the Hubbard Brook Experimental Forest in central New Hampshire. Sediment yields from uncut forests average about 40 kg/ha/yr, but are highly variable from year to year and from watershed to watershed. Disturbances due to cutting and logging can increase sediment yields.

May, Dennis M.; LeDoux, Chris B.; Tansey, John B.; Widmann, Richard. 1994. **Impact of in-woods product merchandising on profitable logging opportunities in southern upland hardwood forests.** Res. Pap. SO-282. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 11 p.

Estimates profitable logging opportunities in upland hardwood forests in 14 southern states and demonstrates the impact of three alternative product-merchandising options on profitable logging opportunities and profit margins.

McFadden, Max W.; Parker, J. Kathy. 1994. **Human values and biological diversity: are we wasting our time?** Canadian Entomologist. 126: 471-474.

Biodiversity is examined from the viewpoint of human values. Three questions are posed: What kinds of human values affect biological diversity? Why do humans think about the loss and conservation of biological diversity? Does it really matter? The conclusion is that human values are contributing to the loss of biological diversity. These values could lead to massive extinctions in the future just as major natural events did in the past.

McLaughlin, S. B.; Layton, P. A.; Adams, M. B.; Edwards, N. T.; Hanson, P. J.; O'Neill, E. G; Ray, W. K. 1994. **Growth responses of 53 open-pollinated loblolly pine familes to ozone and acid rain.** Journal of Environmental Quality. 23(2): 247-257.

McManus, Michael; Solter, Lee; Maddox, Joe; Jeffords, M. R. 1994. **Host specificity of exotic gypsy moth microsporidia to native non-target Lepidoptera.** In: 6th international colloquim on invertebrate pathology and microbial control: Abstracts, Vol. II; 1994 August 18-September 2; Montpellier, France. [Place of publication unknown]: Society for Invertebrate Pathology: 289. Abstract.

McManus, Michael L. 1994. **Impacts of gypsy moth defoliation on forest ecosystems vs. impacts of protecting foliage with pesticides: the need to balance the equation.** In: Kelley, Ronald S., comp. Proceedings of the combined meeting of the Northeastern Forest Pest Council and the 26th annual northeasten forest insect work conference; 1994 March 21-23; Manchester, NH. [Place of publication unknown]: [Publisher name unknown]: 31-32.

McPherson, E. G. 1994. **Using urban forests for energy efficiency and carbon storage.** Journal of Forestry. 92(10): 36-41.

Urban forests ameliorate climate and conserve energy through shading, which reduces the amount of radiant energy absorbed, stored, and radiated by built surfaces; evapotranspiration, which converts radiant energy into latent energy; and air-flow modification, which affects transport and diffusion of energy, water vapor, and pollutants. Tree placement with respect to solar angles and window locations is critical in cooling buildings. Judicious selection and placement of trees is critical in minimizing energy penalties and maximizing energy savings.

McPherson, E. Gregory. 1994. **Benefits and costs of tree planting and care in Chicago.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S., Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 115-133.

Quantifies some of the benefits and costs associated with tree planting and care in Chicago. Benefit-cost analysis was used to estimate the annual dollar value of benefits and costs over a 30-year period associated with the planting and care of 95,000 new trees in Chicago.

McPherson, E. Gregory. 1994. **Cooling urban heat islands with sustainable landscapes.** In: Platt, Rutherford H.; Rowntree, Rowan A.; Muick, Pamela C., comps., eds. The ecological city: preserving and restoring urban biodiversity. Amherst, MA: University of Massachusetts Press: 151-171.

McPherson, E. Gregory. 1994. **Energy-saving potential of trees in Chicago.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 95-113.
Provides information for utilities, policy-makers, planners, urban foresters, arborists, and landscape professionals in the Chicago area on the potential impacts of trees on energy use for residential space conditioning. The cost-effectiveness of tree planting for energy conservation around typical residential buildings is evaluated and guidelines for landscape design are presented.

McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A. 1994. **Sustaining Chicago's urban forest: policy opportunities and continuing research.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 135-137.
Describes relations between the structure of Chicago's urban forest and environmental and ecological processes that influence hydroclimate, carbon flux, energy use, and air quality. The value that Chicagoans place on tree-related services is estimated by accounting for annual benefits and costs associated with planting and long-term care of trees. Strategies that can maximize return on investment are described.

McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. 1994. **Chicago's urban forest ecosystem: results of the Chicago Urban Forest Project.** Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 201 p.
There are an estimated 50.8 million trees in the Chicago area of Cook and DuPage Counties; 66 percent of these trees are in good or excellent condition. During 1991, trees in the Chicago area removed more than 6,000 tons of air pollutants, providing air cleansing valued at $9.2 million. These trees also sequester about 155,000 tons of carbon per year, and provide residential heating and cooling energy savings from reduced carbon emissions from power plants (12,600 tons annually). Shade, lower summer air temperatures, and reduced windspeed associated with increasing tree cover by 10 percent can lower total heating and cooling energy use by 5 to 10 percent annually.

McPherson, Greg; Nowak, David; Rowntree, Rowan. 1994. **Executive summary.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: iii-vi.

McQuattie, Carolyn J.; Rebbeck, Joanne. 1994. **Effect of ozone and elevated carbon dioxide on cuticular membrane ultrastructure of yellow poplar (*Liriodendron tulipifera*).** In: Percy, K. E.; Cape, J. N.; Jagels, R.; Simpson, C. J., comps., eds. Air pollutants and the leaf cuticle. NATO ASI Series G: Ecological Sciences. Vol. 36. Heidelberg, Germany: Springer-Verlag: 175-182.

McQuattie, Carolyn J.; Schier, George A. 1994. **Cytological damage in needles of white pine (*Pinus strobus*) exhibiting symptoms of ozone injury (tipburn).** Ohio Journal of Science. 94(2): 22. Abstract.

McWilliams, William H.; Stout, Susan L.; Bowersox, Todd W.; McCormick, Larry H. 1994. **Advance tree-seedling regeneration and herbaceous cover in Pennsylvania's forests.** Pennsylvania Forests. 85(1): 14-17.
Describes supplemental measurements used by the Forest Inventory and Analysis unit of the USDA Forest Service's Northeastern Forest Experiment Station to evaluate seedling regeneration and herbaceous vegetation. A preview of the results is presented.

McWilliams, William H.; Stout, Susan L.; Bowersox, Todd W.; McCormick, Larry H. 1994. **Can we regenerate Pennsylvania's hardwood forests?** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 23-36.
A study was initiated to provide quantitative measures of the character and abundance of advance tree-seedling regeneration and herbaceous competition within the understory of Pennsylvania's hardwood forests. This required the collection of supplemental understory information during the most recent Pennsylvania forest inventory. Supplemental measurements and a preview of the results are included.

Mendoza, Guillermo A.; Camieri, Celso; Luppold, William G. 1994. **Heuristic and analytical solution procedures for optimal cutting of lumber: an overview.** In: Paredes, V.; Gonzalo, L., eds. Proceedings, international symposium on systems analysis and management decisions in forestry; 1993 March 9-12; Valdivia, Chile. Valdivia, Chile: University of Chile: 343-349.

Mercer, Melissa J.; Kelly, Mary Ellen; Slavicek, James M. 1994. **Characterization of a *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus variant that exhibits enhanced polyhedra production stability during serial passage in cell culture.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 53. Abstract.

Miller, D. R.; Wang, Y.; Ducharme, K.; McManus, M. L.; Reardon, R. 1994. **Wind and stability effects on aerial**

spray penetration into a hardwood forest. In: 21st American Meteorological Society conference on agriculture and forest meteorology; 1994 March 7-10; San Diego, CA. [Place of publication unknown]: American Meteorological Society: 163-166.

Miller, David R.; Yang, Ziusheng; McManus, Michael A. [L.] 1994. **Effects of micrometeorology on aerial spray application of pesticides to hardwood forest canopies.** In: Maarouf, A. R.; Barthakur, N. N.; Haufe, W. O., eds. Biometeorology, part 2, volume 1: proceedings of the 13th international congress of biometeorology; 1993 September 12-18; Calgary, AB. Downsview, ON: Environment Canada: 261-273.

Miller, G. W.; Sullivan, J. 1994. **A mathematical programming model for multi-stand forest management.** ORSA/TIMS Bulletin. 36: 80. Abstract.

Miller, Gary W.; Baumgras, J. B. 1994. **Efficient silvicultural practices for eastern hardwood management.** In: Opportunities for the hardwood industry to address environmental challenges: proceedings of the 22nd annual hardwood symposium of the Hardwood Research Council; 1994 May 12-15; Cashiers, NC. Memphis, TN: Hardwood Research Council: 23-35.
Evaluates four major silvicultural practices used to manage eastern hardwoods: single-tree selection, group selection, two-age management, and even-age management. The analysis focuses on defining variations of these practices that can be applied economically in current markets, and that result in sustainable forests that can be managed economically in the future.

Minocha, Rakesh; Kvaalen, Harald; Long, Stephanie; Minocha, Subhash C. 1994. **Changes in polyamines and their biosynthetic enzymes during somatic embryogenesis of *Picea abies* and *Picea rubens*.** In: Pardos, J. A.; Ahuja, M. R.; Rossello, R. Elena, eds. Biotechnology of trees: proceedings of IUFRO working party S2.04-07, somatic cell genetics; 1993 October 18-22; Valsain, Spain. Fuera de Ser. 4. Madrid, Spain: INIA-Instituto Nacional de Investigacion y Technologia Agraria y Alimentaria: 137-142.

Minocha, Rakesh; Shortle, Walter C. 1994. **Polyamines and inorganic ions extracted from woody tissues by freeze-thawing.** In: Vozzo, J.A., comp. Research and applications of chemical sciences in forestry: proceedings of the 4th Southern Station chemical sciences meeting; 1994 February 1-2; Starkville, MS. Gen. Tech. Rep. SO-104. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station: 28-37.

Minocha, Rakesh; Shortle, Walter C.; Long, Stephanie L.; Minocha, Subhash C. 1994. **A rapid and reliable procedure for extraction of cellular polyamines and inorganic ions from plant tissues.** Journal of Plant Regulation. 13: 187-193.
A fast and reliable method for the extraction of cellular polyamines and major inorganic ions (Ca, Mg, Mn, K, and P) from several plant tissues is described. The method entails repeated freezing and thawing of samples instead of homogenization. The efficiency of extraction of both the polyamines and inorganic ions by these two methods was compared for 10 different tissues. In each case, the freeze-thaw procedure resulted in a precise and quantitatively equal or greater yield than homogenization.

Montgomery, M. E.; Gray, D. R.; Bell, R. A.; Fehringer, J. 1994 **Discussion summary—physiology subgroup.** In: Logan, Jesse A.; ODell, Thomas M.; Gray, David R., eds. Diapause and gypsy moth management: status, applications, and research; 1991 October 2-3; Blacksburg, VA. Gen. Tech. Rep. NE-193. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 55-57.

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Muth, Robert M.; Daigle, John J. 1994. **Subsistence use of natural resources in advanced industrial society: an exploratory study of hunters in Massachusetts.** In: Proceedings of the 5th international symposium of society and natural resources; 1994 June 7-10; Fort Collins, CO. Fort Collins, CO: Colorado State University: 122. Abstract.

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Muzika, R. M.; Wargo, P. M.; Butler, L. 1994. ***Agrilus* and *Armillaria*: agents of mortality in oak defoliated by the gypsy moth.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 65. Abstract.

Muzika, Rose-Marie. 1994. **Defoliation and thinning effects on gypsy moth predators.** Gypsy Moth News. 36: 2-3.

Muzika, Rose-Marie; Wargo, Philip M. 1994. **Oak decline and mortality.** Kelley, Ronald S., comp. In: Proceedings of the combined meeting of the Northeastern Forest Pest Council and the 26th annual northeastern forest insect work conference; 1994 March 21-23; Manchester, NH. [Place of publication unknown]: [Publisher name unknown]: 36.

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Northeastern Forest Experiment Station. 1994. **Kentucky's timber resources.** NE-INF-120-94. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7 p.

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Nowak, David J. 1994. **Air pollution removal by Chicago's urban forest.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 63-81.
Discusses the ways in which urban trees affect air quality, limitations to estimates of pollution removal by trees in the Chicago area, and management considerations for improving air quality with urban trees.

Nowak, David J. 1994. **Atmospheric carbon dioxide reduction by Chicago's urban forest.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 83-94.
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Nowak, David J. 1994. **Modeling air quality effects of trees in Chicago, Illinois.** In: Abstracts of 90th annual meeting of Association of American Geographers; 1994 March 28-April 2; San Francisco, CA. Washington, DC: American Association of Geographers: 277. Abstract.

Nowak, David J. 1994. **Understanding the structure of urban forests.** Journal of Forestry. 92(10): 42-46.
Urban forest structure is the spatial arrangement of vegetation in relation to other objects, such as buildings, within urban areas. Three broad factors determine urban forest structure: urban morphology, which creates the spaces available for vegetation; natural factors, which influence the amount and type of vegetation likely to be found within cities; and human management systems, which modify vegetation configurations across land-use types.

Nowak, David J. 1994. **Urban forest structure: the state of Chicago's urban forest.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban

Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 3-18.
Presents formulas for estimating the leaf-surface area of urban trees, and discusses the importance of urban-forest structure, particularly leaf-surface area.

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ODell, T. M.; Keena, M. A.; Tanner, J. A. 1994. **Discussion summary—management subgroup.** In: Logan, Jesse A.; ODell, Thomas M.; Gray, David R., eds. Diapause and gypsy moth management: status, applications, and research; 1991 October 2-3; Blacksburg, VA. Gen. Tech. Rep. NE-193. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 73-79.
Information required to synchronize gypsy moth management options with the occurrence of stage-specific targets in natural populations is outlined in the context of the F_1-sterile egg program. Development of knowledge for F_1-sterile egg production, storage, acclimation, and timing of application are discussed and testable hypotheses provided. Information developed for the F_1-sterile program should enhance the prediction process for other pest management options.

ODell, T. M.; Mikus, D. R.; Hamid, A. 1994. **The effect of iron bioavailability in a host, gypsy moth (*Lymantria dispar* L.), on reproductive success of a parasitoid, *Glyptapanateles liparadis* Bouche.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 66. Abstract.

ODell, Thomas. 1994. **The Connecticut envirothon program.** The Habitat. 12: 6, 10.

ODell, Thomas M. 1994. **Post diapause in gypsy moth: a review and discussion.** In: Logan, Jesse A.; ODell, Thomas M.; Gray, David R., eds. Diapause and gypsy moth management: status, applications, and research; 1991 October 2-3; Blacksburg, VA. Gen. Tech. Rep. NE-193. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 80-88.
Physiological processes that affect gypsy moth development during postdiapause are reviewed and discussed in the context of diapause in other insects. These processes include neurosecretory release, loss of hardiness to cold, increase in respiration, yolk consumption, and eclosion. Studies to elucidate temperature and other environmental effects on these postdiapause physiological processes and their interaction are recommended for improving the accuracy of predictions of hatch phenology and neonate fitness.

Onstad, David W.; Godfrey, George L.; Jeffords, Michael R.; McManus, Michael L. 1994. **Potential reductions in populations of nontarget Lepidoptera caused by *Bt* applications or gypsy moth defoliation in Illinois.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 67. Abstract.

Parker, S.; Shortle, W. C. 1994. **Identification of Gram-positive bacteria isolated from initial stages of wound-initiated discoloration of red maple (*Acer rubrum* L.) trees.** European Journal of Forest Pathology. 24: 48-54.
Wood shavings from the initial, protective stage of wound-initiated discoloration (stage one) in 12 red maple trees were assayed for the presence of bacteria. Forty-three Gram-positive bacilli were isolated. Nineteen isolates were recovered from the healthy outer sapwood, 7 from the older inner sapwood, and 17 from the central column of stage-one discolored wood. Species of *Actinomyces* were most common (54 percent), followed by species of *Bacillus—B. cereus, B. megatarium,* and *B. mycoides,* (44 percent), and *Cornyebacterium* (2 percent).

Patino, S.; Herre, E. A.; Tyree, M. T. 1994. **Physiological determinants of *Ficus* fruit temperature and implications for survival of pollinator wasp species: comparative physiology through an energy budget approach.** Oecologia. 100(1-2): 13-20.
For pollen dispersal, figs depend on species-specific wasps that develop within fig fruits. These wasps are sensitive to heat and die at temperatures only a few degrees above ambient. In studies of 11 species of Panamanian figs with fruit ranging in diameter from 5 to 50 mm both the relative and absolute contribution of transpiration to maintaining nonlethal fruit temperatures increased with fruit size. Small and large fruits reached temperatures of 3° and 8°C, respectively, above air temperature in full sunlight when transpiration was prevented. The temperature reached by large, nontranspiring fruits was sufficient to kill their pollinators.

Peacock, J. W.; Schweitzer, D. F.; Talley, S. E.; Reardon, R. C.; Wagner, D. L. 1994. **Effects of *Bacillus thuringiensis* (Bt) on non-target Lepidoptera.** In: Proceedings, 1992 national gypsy moth review; 1992 November 2-5; Indianapolis, IN. [Place of publication unknown]: National Gypsy Moth Management Board: 48-50.

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unknown]: National Gypsy Moth Management Board: 77-80.

Percy, K. E.; McQuattie, C. J.; Rebbeck, J. A. 1994. **Effects of air pollutants on epicuticular wax chemical composition.** In: Percy, K. E.; Cape, J. N.; Jagels, R.; Simpson, C. J., comps., eds. Air pollutants and the leaf cuticle, Vol. 36. NATO ASI Series G: Ecological Sciences. Heidelberg, Germany: Springer-Verlag: 67-79.

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Peters, Penn A.; Hassler, Curt C.; Erickson, Michael D. 1994. **Predicting hazardous tree reactions from stand geometry.** ASAE Pap. 937525. St. Joseph, MI: American Society of Agricultural Engineers. 22 p.
The effect of stand geometry on the occurrence of hung trees and broken-limb hazards in partial cut harvests of hardwood stands has been quantified. The likelihood of a hung tree is related to a hangup index, which is a function of hit tree lateral offset, impact height, and impact stress. Broken-limb hazards occur when the diameter at breast height of the felled tree is greater than 18 inches, hit trees are within 22 feet or 40 percent of the felled tree height, and the height of impact is greater than the hit-tree height.

Podgwaite, J. D.; Reardon, R. C.; Webb, R. E. 1994. **Evaluation of aerially-applied Gypchek formulations containing a stilbene optical brightener.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 69. Abstract.

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Riegel, C. I.; Park, E. J.; Burand, J.; Slavicek, James M. 1994. **Generation of an improved biopesticide by deletion of the *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus ecdysteroid UDP-glucosyl transferase gene.** In: Proceedings, 6th international colloquium on invertebrate pathology and microbial control. Vol. I; 1994 August 28-September 2; Montpellier, France. [Place of publication unknown]: Society for Invertebrate Pathology: 424. Abstract.

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Describes the identification, genomic mapping, and nucleotide sequence of the LdMNPV ecdysteroid UDP-glucosyl transferase gene.

Riegel, Christopher I., Park, Eun Ju; Burand, John; Slavicek, James M. 1994. **Deletion of the *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus *egt* gene enhances viral killing speed.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 70. Abstract.

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Riegel, Christopher I.; Slavicek, James M. 1994. **The life-cycle of the *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus is significantly slower than that of AcMNPV in vitro.** In: 13th annual meeting of American Society for Virology: program abstracts; 1994 July 9-13; Madison, WI. [Place of publication unknown]: American Society for Virology: 171. Abstract.

Ristau, Todd E.; Horsley, Stephen B.; McCormick, Larry H. 1994. **Assessing variations in non-arborescent vascular species diversity over time in Allegheny hardwoods.** In: Neal, J. C., ed. Proceedings of the 48th annual meeting of the Northeastern Weed Science Society; 1994 January 3-6; Baltimore, MD. Ithaca, NY: Northeastern Weed Science Society: 42. Abstract.

Rowntree, Rowan A. 1994. **Toward ecosystem management: shifts in the core and the context of urban forest ecology.** In: Bradley, Gordon A., comp., ed. Urban forest landscapes: integrating multidisciplinary perspectives. Seattle, WA: University of Washington Press: 43-59.

Rowntree, Rowan A.; McPherson, E. Gregory; Nowak, David J. 1994. **The role of vegetation in urban ecosystems.** In: McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A., eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 1-2.

The Chicago Urban Forest Climate Project evaluates the role of trees and other vegetation in the regional urban forest ecosystem. Ecosystem analysis provides an effective approach to planning and controlling the distribution of benefits and costs associated with ecological effects. The flow of energy, water, carbon, and pollutants through the ecosystem can be altered by changing the amount and spatial distribution of trees. Continuing research in Chicago and collaborating cities will refine the information needs for urban ecosystem management.

Rudis, Victor A.; McWilliams, William H.; O'Brien, Renee A.; Ohmann, Janet L.; Powell, Douglas S.; Schmidt, Thomas L. 1994. **Forest ecosystems appraisal in the United States.** In: 5th international symposium on society and resource management: creating research, education, and management partnerships among natural resource professionals: book of abstracts; 1994 June 7-10; Fort Collins, CO. Fort Collins, CO: Colorado State University, College of Natural Resources: 320.

Safford, L. O.; Ostrofsky, William B. 1994. **A 35 year record of stand development following seed tree regeneration and seedbed treatment for paper birch 1958-1993.** Meeting of Society of American Foresters; 1994 March 22-24; Manchester, NH. [Place of publications unknown]: [Publisher name unknown].

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Salas. W. A.; Ranson, J. K.; Rock, B. N.; Smith, K. T. 1994. **Temporal and spatial variations in dielectric constant and water status of dominant forest species from New England.** Remote Sensing of Environment. 47: 109-119.

Sarin, Subhash C.; Kline, Earl D.; Aggarwal, Sanjay; Prakash, Divya; Brisbin, Robert L. 1994. **Integrated production control in furniture manufacturing.** In: Szymani, Ryszard, ed. Proceedings, 2nd international symposium on computers in furniture and cabinet manufacturing; 1994 August 23-24; Atlanta, GA. Berkeley, CA: Wood Machining Institute: 119-143.

Scherzer, Amy J. 1994. **Nutrient dymanics of field-grown yellow poplar (*Liriodendron tulipfera* L.).** Ohio Journal of Science. 94(2): 21-22. Abstract.

Schier, G. A.; McQuattie, C. J. 1994. **Influence of carbon dioxide enrichment on response of mycorrhizal pitch pine (*Pinus rigida*) seedlings to aluminum.** In: Abstracts: air pollution & multiple stresses: 16th international meeting for specialists in air pollution effects on forest ecosystems; 1994 September 7-9; Fredericton, NB. Fredericton, NB: Canadian Forestry Service: 64. Abstract.

Schier, George A.; McQuattie, Carolyn J. 1994. **Interacting effects of nutrition and aluminum on the growth of mycorrhizal and nonmycorrhizal pitch pine seedlings.** In: Forest biodiversity in a changing environment: North American forest biology workshop; 1994 June 14-16; Baton Rouge, LA: Baton Rouge, LA: Louisiana State University: 124. Abstract.

Schlessinger, Richard C.; Funk, David T.; Roth, Paul L.; Myers, Charles C. 1994. **Assessing changes in biological diversity over time.** Natural Areas Journal. 14(4): 235-240.

Schuler, Thomas M. 1994. **Crop tree management for central Appalachian hardwood forests.** In: Neal, T. C., ed. Proceedings of the 48th annual meeting of the Northeastern Weed Science Society; 1994 January 3-6; Baltimore, MD. Ithaca, NY: Northeastern Weed Science Society: 78. Abstract.

Schuler, Thomas M. 1994. **Survival and growth of white ash families and provenances 15 years after establishment in West Virginia.** Res. Pap. NE-684. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7 p.
The survival, growth, and stem form of 45 white ash families nested within 22 provenances were evaluated 15 years after establishment in north-central West Virginia. Geographic family origins encompassed a wide area in the Eastern and Central United States, including locations from Maine in the North to Mississippi in the South to Nebraska in the West. There were significant differences among provenances for survival, stem form, total height, and stem diameter, and among families within provenances for stem form and total height. Performance declined north and south of the plantation latitude.

Schuler, Thomas M. 1994. **Survival, growth, and juvenile-mature correlations in a West Virginia sugar maple provenance test 25 years after establishment.** Res. Pap. NE-689. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5 p.
Survival, total height, d.b.h., and stem quality of sugar maple trees of different provenances were compared 25 years after establishment in north-central West Virginia. Provenances were from Michigan, Minnesota, West Virginia, Massachusetts, New Hampshire, Vermont, Maine, and Quebec. There were significant differences between provenances for all traits except stem quality.

Scott, Charles T.; Kohl, Michael. 1994. **Sampling with partial replacement and stratification.** Forest Science. 40(1): 30-46.

Sendak, Paul E. 1994. **Northeastern regional timber stumpage prices: 1961-91.** Res. Pap. NE-683. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 6 p.
State and regional weighted averages were calculated for timber stumpage prices for the Northeast. The weighting factor was the timber volume harvested.

Sendak, Paul E. 1994. **Timber sale value as a function of sale characteristics and number of bidders.** In: Talmon, Judy, tech. ed. Policy and forestry: design, evaluation and spillovers: proceedings of the 1993 southern forest economics workshop; 1993 April 21-23; Durham, NC. Durham, NC: [Publisher name unknown]: 39-42.

Sendak, Paul E.; Huyler, Neil K. 1994. **Timber management and use-value assessment.** Res. Pap. NE-691. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 8 p.
Describes timber management activity and estimates timber harvest from forest land enrolled in Vermont's Use Value Appraisal (UVA) Forest Land property tax program. Data were compiled from the mandatory management plans and annual conformance reports filed for each property enrolled in the program. Overall, 31 percent of the UVA properties reported a commercial harvest during 1989. The harvest on enrolled lands represented 18 percent and 24 percent, respectively, of the reported total sawlog and pulpwood-fuelwood harvest in Vermont in 1989; enrolled lands represented about 16 percent of the total timberland.

Sharov, A. A.; Sheehan, K. A.; Valentine, H. T. 1994. **Foliar growth submodel.** In: Sharov, Alexei A.; Colbert, Jim J., eds. Gypsy moth life system model: integration of knowledge and a user's guide. Blacksburg, VA: Virginia Polytechnic Institute and State University: 35-40.

Sharov, A. A.; Valentine, H. T.; Colbert, J. J. 1994. **Pathogen submodel.** In: Sharov, Alexei A.; Colbert, Jim J., eds. Gypsy moth life system model: integration of knowledge and a user's guide. Blacksburg, VA: Virginia Polytechnic Institute and State University: 77-90.

Sharov, Alexei A.; Colbert, Jim J., eds. 1994. **Gypsy moth life system model: Integration of knowledge and a user's guide.** Blacksburg, VA: Virginia Polytechnic Institute and State University.

Shields, Kathleen S. 1994. **Optical brighteners: effect on peritrophic membrane.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W.; eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 73-74. Abstract.

Siemer, William F.; Batcheller, Gordon R.; Glass, Ronald J.; Brown, Tommy L. 1994. **Characteristics of trappers and trapping participation in New York.** Wildlife Society Bulletin. 22: 100-111.
Discusses results of a mail survey of New York trappers that was designed to provide a quantitative, representative profile of trappers and trapping participation; identify the traps used for 13 furbearer species; and explore the underlying socioeconomic variables that influence trapping involvement in New York.

Slavicek, J. M.; Riegel, C. I.; Park, E. J.; Burand, J. 1994. **Generation of an improved biopesticide by deletion of the *Lymantria dispar* multinucleocapsid nuclear polyhedrosis virus ecdysteroid UDP-glucosyl transferase gene.** In: 13th annual meeting of American Society for Virology: program abstracts; 1994 July 9-13; Madison, WI. [Place of publication unknown]: American Society for Virology: 170. Abstract.

Slavicek, James M.; Schreiber, David E.; Garner, Karen. 1994. **Identification of nuclear DNA markers for use in diagnostic assays to differentiate the Asian and North American strains of the gypsy moth.** In: Hilburn, D. J.; Johnson, K. J. R.; Mudge, A. D., eds. Proceedings of the 1994 annual gypsy moth review; 1994 October 30-November 2; Portland, OR. [Place of publication unknown]: National Gypsy Moth Management Board: 64-65. Abstract.

Smith, H. Clay; Miller, Gary W.; Lamson, Neil I. 1994 **Crop-tree release thinning in 65-year-old commercial cherry-maple stands (5-year results).** Res. Pap. NE-694. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.
Crop-tree release was applied to a 65-year-old cherry-maple stand in north-central West Virginia. Criteria were developed for selecting crop trees for high-quality sawtimber and veneer products. Five-year stand growth, mortality, and ingrowth using basal areas, volume, relative density, and number of trees are reported.

Smith, H. Clay; Miller, Gary W.; Schuler, Thomas M. 1994. **Closure of logging wounds after 10 years.** Res. Pap. NE-692. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 6 p.
Closure of logging wounds on 96 sample trees was evaluated after 2, 5, and 10 years for Appalachian hardwood trees in north-central West Virginia. For yellow-poplar, northern red oak, black cherry, and white oak, many small wounds, 1 to 50 square inches in size, closed between 5 and 10 years after logging. For wounds 51 to 200 square inches, it appears that many may not close for at least 15 to 20 years after logging. Recommendations are provided to minimize logging wounds on residual trees in partially cut stands.

Smith, Harvey R. 1994. **Biodiversity and gypsy moth management.** Gypsy Moth News. 34: 6-8.

Smith, K. T.; Houston, D. R. 1994. **Metal concentrations in wood of sugar maple infected with sapstreak disease.** Canadian Journal of Forest Research. 24: 185-188.
Inoculation of sugar maple saplings with *Ceratosystis virescens* (Davidson) C. Moreau (=*Ceratocystis coerulescens* (Munch) Bakshi), the causal agent of sapstreak disease, resulted in infection and extensive discoloration. A distinct column boundary layer (CBL) formed between the discolored wood and sapwood in wounded saplings infected with *C. virescens* and in noninoculated controls. Elemental markers of discoloration and CBL formation were similar for infected and noninoculated control saplings.

Smith, K. T.; Shortle, W. C. 1994. **A response of red spruce trees to stem wounds.** Lesovedenie. 2: 76-78.

Smith, Paul M.; West, Cynthia D. 1994. **The globalization of furniture industries/markets.** Journal of Global Marketing. 7(3): 103-131.

Solomon, Dale S.; Leak, William B. 1994. **Migration of tree species in New England based on elevational and regional analyses.** Res. Pap. NE-688. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 9 p.
With field measurements of migration patterns, two complementary approaches were used to examine tree-species movement after a documented increase in temperatures. The advancing-front theory was used to examine age trends over distance and elevation for both a mountain site in New Hampshire and a regional comparison across Maine. Well-defined stationary fronts were identified for red spruce and beech, while a catastrophic front was depicted for sugar maple and a constant slow-moving advancing front was exhibited by hemlock. White pine and balsam fir decreased significantly in average latitude and elevation over a 24-year period.

Solomon, Dale S.; Leak, William B. 1994. **Modeling managed early successional mixed-species stands.** In: Mixed stands: research plots, measurements and results, models. Proceedings, symposium of the IUFRO working groups: S4.01-03: design, performance and evaluation of experiments: growth models for tree and stand simulation; 1994 April 25-29; Lousa/Coimbra, Portugal. Lisbon, Portugal: Instituto Superior de Agronomia: 247-254.

Beginning with 25-year-old northern hardwood stands of typical species composition, simulated thinnings were applied at age 30, 60, or both 30 and 60 to favor stems of acceptable growing stock of yellow birch, sugar maple, and white ash. Similarly in spruce-fir, the uniform thinnings were designed to favor acceptable stems of red spruce. Although single thinnings at age 30 or 60 years caused some increase in preferred species and quality stems by stand age 90, the combined effects of both thinnings produced the maximum response: the proportions of preferred species and acceptable growing stock at least doubled by age 90.

Solter, L. F.; Maddox, J. V.; Jeffords, M. R.; McManus, M. L. 1994. **Host specificity of three species of exotic gypsy moth microsporidia to native nontarget Lepidoptera.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 75. Abstract.

Sonderman, D. L.; Brisbin, R. L. 1994. **What is a technical resource center?** In: Foresters together: meeting tomorrow's challenges: proceedings of the 1993 Society of American Foresters national convention; 1993 November 7-10; Indianapolis, IN. SAF Publ. 94-01. Bethesda, MD: Society of American Foresters: 577-578.

Steinberg, D. A.; Pouyat, R. V.; Parmelee, R. W.; Groffman, P. M. 1994. **The effects of non-native earthworms (Megascolecidae) on soil nitrogen mineralization in oak stands along an urban-rural gradient.** In: Science and public policy: program and abstracts, Part 2: abstracts of 79th annual ESA meeting; 1994 August 7-11; Knoxville, TN. Supplement to Bulletin of the Ecological Society of America. 75(2): 219. Abstract.

Stephenson, Steven L.; Kumar, Ashok; Bhatt, Ragendra; Dubey, Tara; Landolt, John C.; Adams, Mary Beth. 1994. **Preliminary checklist of fungi of the Fernow Experimental Forest.** Gen. Tech. Rep. NE-182. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 10 p.
Provides a checklist of fungi found on the Fernow Experimental Forest in West Virginia during 4 years of research and collection. More than 500 fungi in seven major taxonomic groups (Acrasiomycetes, Myxomycetes, Chytridiomcetes, Oomycetes, Acrasiomycetes, Deuteromycetes, and Basidiomycetes) are listed alphabetically by genus and species. Also included is a general description of the forest vegetation of the Fernow Experimental Forest.

Stevens, Thomas H.; Glass, Ronald J.; More, Thomas A. 1994. **Ethics and contingent valuation: a case study of Atlantic salmon restoration.** In: Managing now for the 21st century: food, recreation and diversity: Proceedings, 124th annual meeting of the American Fisheries Society; 1994 August 21-25; Halifax, NS. [Place of publication unknown]: American Fisheries Society: 2. Abstract.

Stevens, Thomas H.; More, Thomas A.; Glass, Ronald J. 1994. **Interpretation and temporal stability of CV bids for wildlife existence: a panel study.** Land Economics. 70(3): 355-363.
Existence values are playing an increasingly important role in wildlife preservation decisions, but little is known about how these values behave over time, and value estimates often are misinterpreted. Results of a panel study suggest that although existence values may be relatively stable, many individuals respond to contingent valuation by bidding their "fair share" for the satisfaction derived from contributing to a good cause, such as environmental quality. Although payment of fair share may represent a lower bound estimate of existence value, payment for a "good cause" may or may not be closely related to the value of the resource itself.

Stevens, Thomas H.; More, Thomas A.; Glass, Ronald J. 1994. **Public attitudes about coyotes in New England.** Society and Natural Resources. 7: 57-66.
A survey of New England residents suggests that achieving an acceptable balance between coyote control and protection is likely to be difficult. Only 5 percent of survey respondents stated that coyotes should be eliminated, but when asked if coyotes should be completely protected, 39 percent agreed, 40 percent disagreed, and 23 percent were willing to pay an average of $5.05 per year for coyote protection. Nineteen percent were willing to pay an average of $4.20 per year to control coyotes. These results indicate that coyotes have existence value.

Stout, Susan L. 1994. **Principles and practices of uneven-age management.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 329-365.

Stout, Susan L. 1994. **Silvicultural systems and stand dynamics in Allegheny hardwoods.** New Haven, CT: Yale University. 168 p. Ph.D. dissertation.

Stout, Susan L. 1994. **Stand data summary and analysis.** In: Marquis, David A., ed. Quantitative silviculture for hardwood forests of the Alleghenies. Gen. Tech. Rep. NE-183. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 79-128.

Stoyenoff, J. L.; Witter, J. A.; Montgomery, M. E. 1994. **Nutritional indices in the gypsy moth (*Lymantria dispar* (L.)) under field conditions and host switching situations.** Oecologia. 97: 158-170.

Stoyenoff, J. L.; Witter, J. A.; Montgomery, M. E.; Chilcote, C. A. 1994. **Effects of host switching on gypsy moth (*Lymantria dispar* (L.)) under field conditions.** Oecologia. 97: 143-157.

Stoyenoff, J. L.; Witter, J. A.; Montgomery, M. E.; Chilcote, C. A. 1994. **The effects of various diet sequences on gypsy moth reared under field conditions in Michigan.** In: Randall, Carolyn J., ed. Michigan forest

health report 1991-1993. For. Health Rep. 91-93. Lansing, MI: Michigan Department of Natural Resources, Forest Management Division: 33.

Stuart, Gordon W.; Dolloff, C. Andrew; Corbett, Edward S. 1994. **Riparian area functions and values—a forest perspective.** In: Riparian ecosystems in the humid U.S.—functions, values and management: conference proceedings; 1993 March 15-18; Atlanta, GA. Washington, DC: National Association of Conservation Districts: 81-89.

Sun, Dong-yu; Minocha, Rakesh; Minocha, Subhash C. 1994. **Genetic transformation of *Populus* to modulate polyamie metabolism.** In: Pardos, J. A.; Ahuja, M. R.; Rossello, R. Elena, eds. Biotechnology of trees: proceedings of IUFRO working party S2.04-07, somatic cell genetics; 1993 October 18-22; Valsain, Spain. Fuera de Ser. 4. Madrid, Spain: INIA-Institute Nacional de Investigacion y Technologia Araria y Alimentaria: 215-220.

Tabor, Christopher A.; Carlos, Andrew S.; Schaberg, Paul G.; Wilkinson, Ronald C. 1994. **Water movement within balsam fir from two environmentally different sites.** Abstracts of papers of 1994 annual meeting of the American Society of Plant Physiologists; 1994 July 30-August 3; Portland, OR. Supplement to Plant Physiology. 105(1): 108. Abstract.

Thibault, Philippe A.; Zipperer, Wayne C. 1994. **Temporal changes of wetlands within an urbanizing agricultural landscape.** Landscape and Urban Planning. 28: 245-251.

Thomas, R. Edward; Gatchell, Charles J.; Walker, Elizabeth S. 1994. **User's guide to AGARIS: Advanced GAng Rip Simulator.** Gen. Tech. Rep. NE-192. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 54 p.
AGARIS, Advanded GAng Rip Simulator, is a computer program available to IBM personal computers with 80286 and higher processors that simulates the gang ripping of lumber and allows the user to perform "what if" types of analysis. The program simulates fixed-arbor and floating outer blade gang ripping. Its user-friendly format allows easy changing of variables. Gang-ripped boards are easily viewed and printed. Data for individual boards and all boards are available by surface area or piece counts.

Torgersen, T. R.; Scott, D. W.; Gillespie, A. J. R.; Hosman, K. P. 1994. **Relationship between lower-crown sampling and midcrown sampling for *Choristoneura occidentalis* (Lepidoptera: Tortricidae) after treatment with *Bacillus thuringiensis*.** Journal of Economic Entomology. 87(4): 1022-1026.

Tritton, Louise, mod. 1994. **Opening remarks. Panel II. What are the major issues in ecosystem management facing the Northeast?** In: McEvoy, Thom J., ed. Ecosystem management: proceedings of a symposium; 1994 July 18-19; Burlington, VT. Burlington, VT: University of Vermont: 23.

Twery, Mark J. 1994. **Meeting tomorrow's challenges in silvicultural prescriptions: the Northeast Decision Model.** In: Foresters together: meeting tomorrow's challenges: proceedings of the 1993 Society of American Foresters national convention; 1993 November 7-10; Indianapolis, IN. SAF Publ. 94-01. Bethesda, MD: Society of American Foresters: 222-226.
The Northeast Decision Model is a computer-based, decision-support system being developed by the Northeastern Forest Experiment Station to provide site-specific expert recommendations on silvicultural prescriptions to improve management for multiple values on forests of the Northeastern United States.

Twery, Mark J. 1994. **The Northeast Decision Model: supporting management decisions for the whole forest.** In: Forestry today: the myth and the magic: proceedings, Allegheny Society of American Foresters 72nd annual winter meeting; 1994 February 9-12; Ellicott City, MD. [Place of publication unknown]: Allegheny Society of American Foresters: 73-78.

Twery, Mark J.; Thomas, Susan; Twardus, Daniel B.; Selmon, Lisa A.; Ghent, John. 1994. **GypsES: a decision support system for gypsy moth management.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 80-81. Abstract.

Twery, Mark J.; Yanai, Ruth D.; Stout, Susan L. 1994. **Understory development following thinning in Allegheny hardwoods.** In: Science and public policy: program and abstracts, Part 2: abstracts of 79th annual ESA meeting; 1994 August 7-11; Knoxville, TN. Supplement to Bulletin of the Ecological Society of America. 75(2): 234. Abstract.

Tyree, Melvin T. 1994. **Ion transport across leaf cuticles: Concepts and mechanisms.** In: Percy, K. E.; Cape, J. N.; Jagels, R.; Simpson, C. J., comps., eds. Air pollutants and the leaf cuticle. NATO ASI Series G: Ecological Sciences. Vol. 36. Heidelberg, Germany: Springer-Verlag: 175-182.
Reviews the physical chemistry of ion movements in water and membrane-solutions and discusses what happens at the interface between water and membrane-solution. Studies of ion migration can provide valuable insights into the structure of cuticles.

Tyree, Melvin T.; Davis, Stephen D.; Cochard, Herve. 1994. **Biophysical perspectives of xylem evolution: is there a tradeoff of hydraulic efficiency for vulnerability to dysfunction?** IAWA Journal. 15(4): 335-360.
Discusses the possible benefits and costs of large conduits from a biophysical perspective.

Tyree, Melvin T.; Kolb, Kimberley J.; Rood, Stewart B.; Patino, Sandra. 1994. **Vulnerability to drought-induced cavitation of riparian cottonwoods**

in Alberta: a possible factor in the decline of the ecosystem? Tree Physiology. 14: 455-466.
Vulnerability of xylem to loss of hydraulic conductivity caused by drought-induced cavitation was determined for three riparian cottonwood species in Lethbridge, Alberta: *Populus deltoides* Bartr., *P. balsamifera* L., and *P. angustifolia* James. These species suffered a 50-percent loss of hydraulic conductivity in 1-year-old stem segments when xylem pressure potential fell to -0.7 MPa for *P. deltoides* and -1.7 MPa for *P. balsamifera* and *P. angustifolia*. The possible contribution of drought-induced xylem dysfunction to the decline of riparian ecosystems in dammed rivers is discussed.

Tyree, Melvin T.; Yang, Shudong; Cruiziat, Pierre; Sinclair, Bronwen. 1994. **Novel methods of measuring hydraulic conductivity of tree root systems and interpretation using AMAIZED.** Plant Physiology. 104: 189-199.
Steady-state and dynamic methods were used to measure the conductivity to water flow in large, woody root systems. A hysteresis was observed in the relationship between applied pressure and resulting flow during dynamic measurements. A mathematical model (AMAIZED) was derived for the dynamics of solute and water flow in roots. The model was used to interpret results obtained from steady-state and dynamic measurements.

Valaitis, Algimantas P. 1994. **Characterization of the midgut proteases of gypsy moth larvae.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 82. Abstract.

Valaitis, Algimantas P. 1994. **Distribution and properties of midgut digestive proteinases in the gypsy moth.** The FASEB Journal. 8(7): A1370. Abstract.

Valaitis, Algimantas P. 1994. **Effects of proteinase inhibitors on midgut proteinases and the growth and development of gypsy moth larvae.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 83. Abstract.

Valentine, Harry T.; Baldwin, V. C., Jr.; Gregoire, Timothy G.; Burkhart, Harold E. 1994. **Surrogates for foliar dry matter in loblolly pine.** Forest Science. 40(3): 576-585.
Examines the relations between foliar dry matter (F) and its potential surrogates, A and BR, in loblolly pine. Also examined are relations between the foliar dry matter and cross-sectional areas of first-order branches.

Valentine, Harry T.; Ludlow, Anthony R.; Furnival, George M. 1994. **Modeling crown rise in even-aged stands of Sitka spruce or loblolly pine.** Forest Ecology and Management. 69: 189-197.
A "crown rise" model that estimates average height to the base of a crown in an even-aged, monospecific stand is derived and fitted to data on loblolly pine and Sitka spruce. Estimated standard errors are less than 1 m. The driving variables are average tree height and tree count per unit area or average inter-tree distance. Two potential uses of the crown rise model are a component of an empirical or mechanistic forest model, and an alternative to stocking charts for stand-density management.

Veen, Cynthia; Federer, C. Anthony; Buso, Donald; Siccama, Thomas. 1994. **Structure and function of the Hubbard Brook data management system.** Bulletin of the Ecological Society of America. 75(1): 45-48.

Wade, Gary L.; Tritton, Louise M. 1994. **Evaluating biodiversity of landscape units with respect to scale, diversity types, and social stakes.** Supplement to Bulletin of the Ecological Society of America. 75(2): 239. Abstract.

Wagner, David L.; Carter, Jane L.; Peacock, John W.; Talley, Steve E. 1994. **A field assessment of the effects of *Bacillus thuringiensis* on non-target Lepidoptera.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 84. Abstract.

Waite, C. E.; DeHayes, D. H.; Rebbeck, J.; Schier, G. A.; Johnson, A. H. 1994. **The influence of elevated ozone on freezing tolerance of red spruce seedlings.** New Phytologist. 126: 327-335.

Wallner, W. E.; Grinberg, P. S.; Keena, M. A. 1994. **Female flight: evaluation of Asian gypsy moth and its hybrids.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 89. Abstract.

Wallner, W. E.; Grinberg, P. S.; Walton, G. S. 1994. **Differentiation between gypsy moth (Lepidoptera: Lymantriidae) populations by spectral color discrimination of head capsules.** Environmental Entomology. 23(3): 659-664.
Head capsules of 579 individuals from 28 different populations of gypsy moth were classified with an analysis of their color spectrum. On the basis of 26 variables derived from 17 million color combinations of red, green, and blue, a set of numeric characteristics allowed discrimination among gypsy moth populations from the former Soviet Union, the Northeastern United States, and the laboratory. This procedure might be useful when head-capsule data and/or other spectral information are used in studies of biocontrol, behavior, and population dynamics.

Wallner, William E. 1994. **Asian gypsy moth research planning and accomplishments.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 85-88. Abstract.

Wallner, William E. 1994. **Attractancy to light and flight behavior of Asian gypsy moth females.** In: Kuharic, Kathryn E., comp. Proceedings, 1993 annual gypsy moth review; 1993 November 1-4; Harrisburg, PA. [Place of publication unknown]: National Gypsy Moth Management Board: 30-33.

Wallner, William E. 1994. **What is the Asian gypsy moth?** In: National Plant Board 68th meeting; 1994 August 7-10; Helena, MT. Chicago, IL: National Plant Board: 75-76.

Walstad, John D.; Edge, W. Daniel; deCalesta, David S.; Sulzmann, John T. 1994. **A field guide to vertebrate pests of Pacific Northwest conifers.** Corvallis, OR: Oregon State University, College of Forestry. Video, 22 minutes.

Wargo, Philip. 1994. **Decline diseases: barometer or cause of change in forest health.** In: Kelley, Ronald S., comp. Proceedings of the combined meeting of the Northeastern Forest Pest Council and the 26th annual northeastern forest insect work conference; 1994 March 22-23; Manchester, NH. [Place of publication unknown]: [Publisher name unknown]: 33. Abstract.

Webb, R.; Cook, S.; Podgwaite, J.; Dill, N.; Shapiro, M.; Thorpe, K.; Venables, L.; White, G.; Ridgway, R.; Farrar, R., Jr.; Reardon, R.; Mierzejewski, K.; Fuester, R.; Argauer, R.; Witcosky, J. 1994. **Aerial evaluations of Gypchek formulations with and without small quantities of Blankophor BBH, an enhancing adjuvant, supported by a ground dose response study.** In: Fosbroke, Sandra L. C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture interagency gypsy moth research forum 1994; 1994 January 18-21; Annapolis, MD. Gen. Tech. Rep. NE-188; Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 90. Abstract.

Webb, R. E.; Dill, N. H.; Podgwaite, J. D.; Shapiro, M.; Ridgway, R. L.; Vaughn, J. L. 1994. **Control of third and fourth instar gypsy moth (Lepidoptera: Lymantriidae) with Gypchek combined with a stilbene disulfonic acid additive on individual shade trees.** Journal of Entomological Science. 29(1): 82-91.

Webb, R. E.; Podgwaite, J.; Dill, N.; Shapiro, M.; Cook, S. 1994. **Field studies with Gypchek formulations with and without an enhancing adjuvant in Maryland and West Virginia in 1993.** In: Kuharic, Kathryn E., comp. Proceedings, 1993 annual gypsy moth review; 1993 November 1-4; Harrisburg, PA. [Place of publication unknown]: National Gypsy Moth Management Board: 96. Abstract.

Webb, R. E.; Shapiro, M.; Podgwaite, J. D.; Ridgway, R. L.; Venables, L. 1994. **Effect of optical brighteners on the efficacy of gypsy moth (Lepidoptera: Lymantriidae) nuclear polyhedrosis virus in forest plots with high or low levels of natural virus.** Journal of Economic Entomology. 87(1): 134-143.

West, Cynthia D. 1994. **Current status of U.S. hardwood chip export trade to Asia.** In: The globalization of wood: supply, processes, products, and markets: proceedings of a conference; 1993 November 1-3; Portland, OR. Madison, WI: Forest Products Society: 224-225.

West, Cynthia; Hansen, Bruce. 1994. **U.S. hardwood—the market in Europe.** Cabinet Maker Europe. 1(2): 18-19.

West, Cynthia D.; Tritton, Louise M. 1994. **Future trends and challenges for marketing research in the U.S. Forest Service: the Northeastern Forest Experiment Station example.** In: Juslin, Heikki; Pesonen, Miikka, eds. Towards an integrated theory of forest products marketing: proceedings, forest products marketing seminar; 1994 January 9-12; Helsinki, Finland. Publ. 1. Helsinki, Finland: University of Helsinki: 13-18.
Describes how two research projects in the Northeastern Forest Experiment Station are incorporating the human dimension of ecosystem management into their research programs.

Wharton, Eric H. 1994. **A billion board feet and beyond: the timber industries of Pennsylvania, 1988.** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 61-81.
Reports on primary wood manufacturers in Pennsylvania that convert logs, bolts, and chipped timber into lumber pulp, veneer, cooperage, and dimension products. Describes forest-product use in the state.

Wharton, Eric H.; Bearer, John L. 1994. **The timber industries of Pennsylvania, 1988.** Resour. Bull. NE-130. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 40 p.
Evaluates regional timber output of Pennsylvania on the basis of a survey of primary processing mills located in the state, and of mills in other states that used wood from Pennsylvania. Includes statistics on industrial timber production and mill receipts and the production and final end use of manufacturing residues. Historical and current data are compared and trends in industrial wood output are noted.

Widmann, Richard H. 1994. **New survey of Pennsylvania's forests shows continued increases in timber volume, but oaks decrease.** Pennsylvania Forests. 85(1): 8-11.

The USDA Forest Service in cooperation with the Pennsylvania Bureau of Forestry and the Allegheny National Forest has completed the fourth statewide inventory of Pennsylvania's forests. Previous surveys were conducted in 1955, 1965, and 1978. Significant changes in the characteristics of Penn's Woods have occurred since the last survey, and a fresh look at the resource provides insights into its use and management.

Widmann, Richard H. 1994. **Practical limitations in using FIA data.** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 157-159.

Widmann, Richard H. 1994. **The 1990 Pennsylvania forest inventory—documenting a decade of change.** In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods—change and challenge: proceedings of the 1993 Penn State forest resources issues conference; 1993 April 1-2; University Park, PA. University Park, PA: Pennsylvania State University: 1-14.
Discusses the fourth statewide inventory of Pennsylvania's forests.

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