Publications of the Northeastern Forest Experiment Station: 1993 and 1994
Publications—1993

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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, 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; NH₄NO₃ 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, SO₄, or NO₃. On another, stream export of NO₃ and Ca have increased due to acidification treatments.


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.


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.


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.


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.


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.


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.


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.


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.


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 reported 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.


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.


Presents findings of the 1989 Pennsylvania forest survey as it relates to wildlife habitat resources.


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.


Presents methods and results for producing spatial estimates of carbon densities (carbon per unit area, Mg ha⁻¹ [1 Mg = 10⁶ 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.**

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.


Two-year-old seedlings of white oak and red oak were exposed to ozone (O₃) 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 O₃. Two simulated rain treatments, pH 4.2 and pH 3.0, 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.


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.


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+LNP treatment attained the greatest total biomass, 45 Mg/ha, while the unmowed control attained the least, 2 Mg/ha.


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.


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.


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.


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


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.


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.


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.


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.


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.


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.


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.


The toxicity of a series of organophosphorous 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.


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.


Reviews specific trends in the stocking of oak on land that has remained in forest since the inventory in 1978.


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.


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): 30-42. 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 Klin Dried Rule was used to grade the boards. The percentage of a board's surface moisture 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.


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.


Gottschalk, Kurt W. 1993. Oak silviculture, management, and defoliation effects in France and Germany. In: Gillespie, Andrew R.; Parker, George R.; Pope, Philip 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. 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.


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.


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.


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.


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.


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.


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.


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.


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 337 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.


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.


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.


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.


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 260 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.


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 present than where it was absent. Allelopathic 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, saphaling, 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.


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.


Discusses “good” stewardship practices in the management of woodlots.


Compares growth and yield study plots with sample plots. As an example, the 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.


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.


As increased demand for woodlot 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.


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 monoterpene 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.


The correlation of various pre-season field measurements with subsequent defoliation by the gypsy moth was examined for a series of forest stands in central Pennsylvania. Measurements included pre-season 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.


Discusses the development of two technologies that have created new opportunities for analyzing spatial patterns in insect populations: geographic information systems and geostatistics.


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.


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.


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; 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

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.


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.


Summary of erosion in New England forests with emphasis on research results from the Hubbard Brook Experimental Forest.


Proper planning and placement of trees as part of a utility demand-side management 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 presented.

McPherson, E. Gregory; Nowak, David J. 1993. Value of
urban greenspace for air quality improvement:
Daily air pollutant uptake by trees in a 525-acre section of
Lincoln Park was estimated for four different, polluted 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.; Pinchard, Scott E.; Makra, Edith M. 1993. Chicago's
evolving urban forest: Initial report of the Chicago
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
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.
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.

McQuattle, 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
International conference: heavy metals in the
Ltd. 79-76.
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.

McQuattle, 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 fogged 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 mesophyll. 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.

McQuattle, 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; Schelke, 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.


McWilliams, William H.; Hershey, Rachel Riemann; Drake, David A.; Aleich, 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.; Aleich, 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 database with spatial information managed by a geographical information system. The results illustrate how simple measurements 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 knowledge 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 is often 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.


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.


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 tissues. 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. Spemmine was present in only minute quantities and showed only a small change with time.


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.


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."


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.


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.


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 $395.7 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.


O'Dell, 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.


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.


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, 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 Gypek and Bacillus thuringiensis. Journal of Economic Entomology. 86(3): 730-734.

Low-density gypsy moth populations in Virginia were treated aerially with the nucleopolyhedrosis virus (baculovirus) product Gypek and with a commercial preparation (SAN 415 SC 32LV) of the NRD-17 strain of Bt. Weekly counts of live larvae under burlap bands were significantly lower in Gypek- and SAN 415-treated plots than in control plots, but defoliation differences between sprayed and control plots were not significant.


Presents results of a study of Prague's urban forests, based on a 16-neighborhood sample, conducted in 1987 and updated in 1990.


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.


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, Takeki, comps. A report from the second U.S./Japan workshop on global change research: environmental response technology (mitigation and adaptation); 1993 February 1-3; Honolulu, HI. CONF-930285. [Place of publication unknown]: Publisher name unknown: 257-263.


Schreuder, H. T.; Li, J.; Scott, C. T. 1993. Estimation with different stratification at two occasions. Forest Science. 39(2): 368-362. 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.


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.; Cassell, David L.; Hazard, John W. 1993. Sampling design of the U.S. National Forest Health Monitoring Program. In: Nysssson, Arne; Pose, Sinu, Rautala, Johanna, eds. Proceedings of Iversaloo 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-km² 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 Eidgenoessischen 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.


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.


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.


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.


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.


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.


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.


The effectiveness of compartmentalization following wounding was zone 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.


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.


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.


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.


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 m2 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
time of number of trees to sample for desired precision 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: Liebold,
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
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.

plans for the decision support system for gypsy
moth management. In: Fosbrooke, Sandra L. C.;
Gottschalk, Kurt W., eds. Proceedings, U.S. Department
of Agriculture interagency gypsy moth research forum
Rep. NE-179. Radnor, PA: U.S. Department of
Agriculture, Forest Service, Northeastern Forest
Experiment Station: 109. Abstract.

Tyree, M. T.; Cochard, H.; Cruciat, 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. Refract 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.
Whole shoot resistance to water flow was measured in
Quercus robur L., Q. petraea Matt Liebl, Q. pubescens
Wild, and Q. robur L. Shoots 4 to 8 years old were 1.1 to
1.5 m long and 15 to 19 mm in basal wood diameter. Whole
shoot resistances accounted for 30 to 40 percent of the
total resistance to water flow from soil 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
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.

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
cductive 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.

relations and the effects of elevated CO2: a review
and suggestions for future research. Vegetatio. 104/
105: 47-62.
Summarizes work done on the effects of elevated CO2 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, Alginantas P. 1993. Isolation and kinetic
properties of the larval brain phosphofructokinase
from the gypsy moth, Lymantria dispar. Comparative
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.

The midgut trehalase (THA) from 5th-instar gypsy moth larvae was purified to homogeneity by gel filtration followed by Rotofer 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 pl 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.


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.


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.


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.


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.


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-out stand. Seedlings planted within tree shelters and fences were inside tree shelters. Natural seedlings grew little and their height inside and outside of tree shelters did not differ.

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.

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 atrorubenum, and the twolined chestnut borer, Agrius bilineatus.

Describes a study conducted to determine the relationship between root vitality and crown deterioration for both healthy and declining red spruce trees.


Gypsy, 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 Gypsy applied without sunscreen, and an untreated control. A dose-response was demonstrated for both the Abington and Gypsy strains. The Abington isolate killed significantly faster than the Gypsy strain; there was no statistical difference in larval mortality between the two products.

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 than 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.


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.

Agnculture, Forest Service, Northeastern Forest Experiment Station. 52 p.
Present 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.

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.


Pupal parasitism of the gypsy moth was monitored in 15 study plots in New Jersey from 1978 to 1988. The predominant parasitoid was a chalcid 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.

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.

The manual method for analyzing ammonium (NH₄⁺) 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.


Witkosky, Jeffrey L.; Dubois, Normand R.; Mierzejewski, Karl J.; Sellars, Patricia A.; Reardon, Richard C. 1993. Field efficacy of Bacillus thuringiensis Thurlide 64LV applied undiluted at two different drop sizes for control of third and fourth instar gypsy moth infestations. In: Kuharc, 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-

Abstract.


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.


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.


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.


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 km² in Prince Georges and 8.4 km² 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.


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.


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 are buying land in small cities or towns; and more owners intend to harvest timber products than previously.

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.


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 outcropping 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.


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 skylane yarning 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.


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.


The Lymnaea dispar multinucleocapsid nuclear polyhedrosis virus (LdMNVP) gene encoding vPK has been cloned and sequenced. LdMNVP vPK shows a 24-percent amino acid identity to the catalytic domains of the eucaryotic protein kinases nPKC from rabbits, HSPKCE from humans, APLPKGB from Apisida californica, and dPKC90 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.


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".


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.


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.


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 Rhaphiolepis racemiflora (Steu.) 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.


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.


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.


The flux of CO₂ 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.


ecology of unmanaged deer populations; 1994 November 10-11; Front Royal, VA. [Place of publication unknown]: [Publisher name unknown]: 8. 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.


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 18 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.; Mierzewski, 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.


Edwards, Pamela J.; Wood, Frederica. 1994. Centroid lag time changes resulting from harvesting, herbiciding, and stand conversion. In: Marston, Richard A.; Hasfurter, 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.

Ellsworth, D. S.; Tyree, M. T.; Parker, B. L.; Skirner, 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 CO₂ assimilation rate for fully expanded leaves by approximately 20 percent, though leaf chlorophyll content and leaf mass per unit area apparently were not affected.


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.


Gansner, David A.; Arner, Stanford L.; Hershey, Rachel H.; Alenach, Carol 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.


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.


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.


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 SO4 concentrations in the spoil leachate and on the spoil. Adding HA and full aqueous material created a longer lasting desirable effect on leachate pH and Al, Fe, Mn, and SO4 than additions of FA or OM of five other species. Revegetation resulting in rapid production of mature soil OM may reduce the amount of some ions commonly leached from acid mine spoils.


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.


Iwo 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.


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.


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.


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.


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 wind speed, air temperature, and humidity at the nearest airport as reference conditions to compare differences in these climate variables between points in residential neighborhoods.


The 5.4-kb RNA enriched in mRNA coding for the large subunits of vitellogenin (Vg) 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 Vg mRNA. The cDNA representing the 5’-terminal region of Vg 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 antisemur.


The eddy-correlation technique was used to investigate the exchange of CO2 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 CO2 uptake exceeded 15 μmol/m2s, 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 μmol/m2s.


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.


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.


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.


The patterns of the spread and development of the causal agents of beech bark disease in North America are discussed.


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, sapfelling, 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.


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.


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 Cornell, New York.


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.


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.


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.


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.; ODell, Thomas M. 1994. *Effects of laboratory testing on the gypsy moth (Lepidoptera: Lymantridae)*. 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 (NJS3) 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.


In the Northeast, forest stands on xeric sites such as ridge tops 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.


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. Hadnor, 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.


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.


Leak, William B.; Yamashiki, 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.


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 thinning 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; Frederick, NB. [Place of publication unknown]: [Publisher name unknown]: 38. Abstract.


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.


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.


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:**


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.


Includes lectures from the annual silviculture training sessions designed to explain and demonstrate the silvicultural prescription system to practicing foresters.


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.


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.


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.


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 northeastern forest insect work conference; 1994 March 21-23; Manchester, NH. [Place of publication unknown]: Publisher name unknown: 31-32.


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 collection and placement of trees is critical in minimizing energy penalties and maximizing energy savings.


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.


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 wind speed associated with increasing tree cover by 10 percent can lower total heating and cooling energy use by 5 to 10 percent annually.


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.


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 those practices that can be applied economically in current markets, and that result in sustainable forests that can be managed economically in the future.


A fast and reliable method for the extraction of cellular polyamines and major inorganic ions (Ca, Mg, Mn, K, and Pi 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.


ODell, T. M.; Katovich, Steven; Teale, Steven. 1994. Pest management options for white pine ecosystems. 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]: 29-30.


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 F₁-sterile egg program. Development of knowledge for F₁-sterile egg production, storage, acclimation, and timing of application are discussed and testable hypotheses provided. Information developed for the F₁-sterile program should enhance the prediction process for other pest management options.


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 hardness 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.


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 Actinomycetes were most common (54 percent), followed by species of Bacillus—B. cereus, B. megatarium, and B. mycoides, (44 percent), and Corynebacterium (2 percent).


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.


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


The effect of stand geometry on the occurrence of hanging trees and broken-limb hazards in partial cut harvests of hardwood stands has been quantified. The likelihood of a hanging 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.


The nation's forest inventory has a rich history of serving the needs of the forestry profession and the natural resources community. It has evolved and adapted as research questions and clientele demands have changed through the years. This process continues today as the Forest Service works with its partners to forge a new inventory that responds not only to landowner objectives but also to public concerns about our environment.


Describes the biology and mode of action of Bt against gypsy moth, including its application, efficacy, safety, effects on nontargets, resistance, and interaction with natural enemies.


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


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.


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.


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 Valo 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 16 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.


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.


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.


Inoculation of sugar maple saplings with Ceratosysits virens (Davidson) C. Moreau (=Ceratosysits coerulescens (Munch) Bakshi), the causal agent of sapstreak disease, resulted in infection and extensive discoloration. A distinct columnar boundary layer (CBL) formed between the discolored wood and sapwood in wounded saplings infected with C. virens and in noninoculated controls. Elemental markers of discoloration and CBL formation were similar for infected and noninoculated control saplings.


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.

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.


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 (Acromycetes, Myxomycetes, Chytridiomycetes, Oomycetes, Ascomycetes, 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.; 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, 59 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.


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.


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.


Discusses the possible benefits and costs of large conduits from a biophysical perspective.

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* Bttr., *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.


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.


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.


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.


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 headcapsule data and/or other spectral information are used in studies of biocontrol, behavior, and population dynamics.

55


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: Lymantridae) nuclear polyhedrosis virus in forest plots with high or low levels of natural virus. Journal of Economic Entomology. 87(1): 134-143.


Describes how two research projects in the Northeastern Forest Experiment Station are incorporating the human dimension of ecosystem management into their research programs.


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.; Gansner, David A. 1994. What’s up with maples in Pennsylvania. 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: 42-49. Recently there has been concern that red maple is taking over Pennsylvania’s forests. At the same time, the national media has reported that due to acid rain, sugar maple may be nearing extinction. Information is presented on Pennsylvania’s maple resource, particularly the Allegheny Unit, where foresters have noticed a decline in sugar maple trees.


Wiedenbeck, Janice K.; Gatchell, Charles J.; Walker, Elizabeth S. 1994. Data bank for short-length red oak lumber. Res. Pap. NE-695. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 16 p. Describes data bank for short-length lumber (less than 8 feet long) that contains information on board outlines and defect size and quality for 426 4/4-inch-thick red oak boards. The Selects, 1 Common, 2A Common, and 3A Common grades are represented in the data bank. The data bank provides the kind of detailed lumber description that is required as input by computer programs that analyze rough-mill yield.


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Wong, B. L.; Baggett, K. L.; Chapman, K. D.; Melhuish,
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1993 November 4-5; Austin, TX. [Place of publication
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Yang, Shudong; Tyree, Melvin T. 1994. Hydraulics
architecture of Acer saccharum and A. rubrum:
comparison of branches to whole trees and the
contribution of leaves to hydraulic resistance.

The hydraulic resistances of whole shoots, branches,
petioles, and leaf blades in maple trees of different size
were measured. The basal diameter of the branch or the
trunk was taken as an approximate measure of the age of
the branch or whole tree. that is, changes in hydraulic
resistances or conductances with basal diameter were
taken as approximate indicators of the developmental
sequence of these parameters with age.

Yang, X.; Heister, G. M.; Montgomery, M. E.; Sullivan, J. H.
1994. Radiative properties of hardwood tree leaves
with respect to ultraviolet radiation. In: Proceedings,
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Yaussy, Daniel A. 1994. Quality Improvements to

Methods for estimating current and future tree quality have
been added to the OAKSIM and NE-TWIGS growth and
yield simulators. These additions allow better estimates of
stand value and thinning options.

Yaussy, Daniel A.; Sutherland, Elaine Kennedy. 1994. Fire
history in the Ohio River Valley and its relation to
climate. In: Proceedings, 12th international conference
on fire and forest meteorology; 1993 October 26-28;
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Annual wildfire records (1926-77) from the national forests
in states bordering the Ohio River (Indiana, Kentucky, Missouri, Ohio, and West Virginia) were
compared to climate records to assess relationships.
Summaries of spring and fall fire seasons obtained for the
Daniel Boone National Forest in Kentucky (1970-92) and for
Ohio (1969-84), allowed detailed analysis. A wet spring
followed by the onset of drought conditions, as measured
by Palmer’s Drought Severity Index, was significantly
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Clusia uvitana Pittier (Clusiaceae) is a tropical
hemiepiphyte that displays a high plasticity in the
expression of CAM in response to the environment. When
water is available, CO2 is taken up mostly during the day. A
study of water relations and hydraulic architecture revealed
that leaf water potentials (Psi) ranged from -0.7 to -0.9 MPa
and changed little with time or water availability. The
absolute hydraulic conductivity of stem segments and the
specific conductivity were comparable to many other
temperate and tropical species, but leaf specific
conductivity was one-third to 1/30 that of many other
species.
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