1977-1978 report

northeastern forest experiment station

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NORTHEASTERN FOREST EXPERIMENT STATION
370 REED ROAD, BROOMALL, PA. 19008

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INTRODUCTION

The fourteen States in the Northeastern Forest Experiment Station's territory include a great diversity of conditions. Half of the area is covered by forests varying from remote, roadless, backcountry forests to urban forests and from spruce/fir woods of Maine to the hardwoods of the Ohio River basin. About a third of the Nation's people live here, some in big cities, some on farms, some in small towns, but all in or near the forest. These forests provide people with raw materials for industry, vital products such as paper and fine furniture, water for homes and industry, habitat for wildlife and fish, recreational opportunities, and a quality environment.

The Northeastern Station's research programs are as diverse as its territory. During 1977-78, 150 scientists in 36 teams at 15 locations had 690 research studies underway on 107 broad research problems. Many of these studies are being done in cooperation with universities in this area, and a few as far away as California. The research varies from finding better ways to grow and use hardwood trees, to improving impacts of strip mining, to understanding basic biological relationships in trees themselves and among trees in forest environments and city environments.

The highlights in this report are only a sample of the research done by the Station in 1977-78. The bibliography is a complete listing of our published research results.

We continued to work with the Association of State College and University Research Organizations (ASCUFRO) on long-range planning. With ASCUFRO we held work conferences of scientists and with representatives of forest users, the general public, to identify forestry research needs and priorities. The results of this planning effort were published in 1978 in "Program of Research for Forests and Associated Rangelands - Northeastern Region," USDA-Forest Service General Technical Report NE-42. Similar planning was done in the Southern, Western, and North Central Regions of the country. The national perspective has been compiled in "National Program of Research for Forests and Associated Rangelands," USDA-Forest Service.

We have been working closely with the Northeastern Area, State and Private Forestry, to strengthen timeliness

and effectiveness of efforts to get research results applied. Examples include work on hardwood mill improvement, the loblolly X pitch pine hybrid, gypsy moth management, and the weak link approach to logging analysis.

The work to find effective ways of protecting American elm trees from Dutch Elm Disease continued and is yielding significant results. The special accelerated program on the gypsy moth, as part of a USDA team effort, has been phased down as scheduled. A compendium of research findings is being prepared for publication. We are continuing important work on the gypsy moth where leads are promising or gaps in knowledge are critical.

As the accelerated Gypsy Moth Program winds down, we have mobilized a special accelerated program of research on the spruce budworm problem. This insect has been very destructive over vast acreages in Canada for many years and is affecting parts of northeast and northcentral states. The research program is designed to take a comprehensive and long-range view of the problem and seek an integrated pest management approach that will be environmentally acceptable as well as effective in protecting the forest. Our spruce budworms program is coordinated with a similar effort in the far West and is part of a Canadian-U.S. scientific partnership.

The Northeastern Station has been doing research on strip mining for many years. The aim is to help design mining operations to minimize damage to soil and water and to have economical and effective ways of restoring the land to a productive condition. Demands for new and better technology is higher now than ever before, and we have increased the size of this program.

We have established a new project on urban forestry on the campus of the College of Environmental Science and Forestry at Syracuse, New York. Combining the scientific expertise in forestry, geography, and urban planning, and working cooperatively with the College and other universities, the project is seeking ways to incorporate urban forestry into overall urban planning. Related research continues in cooperation with the nine-university Consortium for Environmental Forestry Studies and at our projects at Amherst, Massachusetts and State College, Pennsylvania. The Pennington, N.J., project moved to the Pennsylvania State University campus in September 1978.

We are continuing to search for better ways of harvesting hardwood timber on rough Appalachian terrain while minimizing environmental impacts and have developed some promising leads.

Forest Recreation Research at this Station has nationwide significance. Building on earlier success in analyzing demand and markets for camping, scientists have studied the national outlook for skiing. Another team is contributing to our knowledge of ways of managing recreation in backcountry and their new waste composter is being pilot tested in the Cascade mountains of Washington as well as the White Mountains of New Hampshire.

Our Renewable Resources Evaluation project continued to maintain their excellent record of keeping up with the 10 year cycle of forest surveys of the 14 states and also expanded its work to collect and analyze more data about a variety of forest resources in addition to timber.

The energy crisis is real in the Northeast, and many people are turning back to wood for home heat. Forest industries are using wood waste for all or part of their needs. A few pioneering institutions, such as hospitals, have converted to wood from fossil fuel. There is also an interest in the potential for forests to fuel electric power generating plants. We have redirected some of our scientific manpower to study these important areas and are working closely with other agencies with related missions.

Many years of work have led to development of a loblolly X pitch pine hybrid that shows great promise for combining the form and growth of the loblolly pine with the hardiness and fire resistance of pitch pine. These trees are being field tested in cooperation with several states and industry.

Our old friends will notice that our mailing address has changed from Upper Darby to Broomall, Pa. Early in 1978 Station headquarters offices were moved a few miles to a more suitable office building.

RESEARCH HIGHLIGHTS

DUTCH ELM DISEASE

Not long ago, Dutch elm disease (DED), a major disease of both urban and forest trees, was uncontrollable. There were heavy losses of timber and urban trees. Researchers have developed strategies that will help control DED including injecting trees, using pheromonal or host attractant chemicals, and removal of infected trees.

INTENSIFIED SANITATION CONTROL

Studies have confirmed the possibility of reducing the incidence of DED by increasing the speed with which diseased trees are identified and removed. A cost analysis was developed that showed this sanitation program to be more economical than usually practiced ones.

These new results were obtained by increasing the number of disease surveys from one to three during the summer. Affected trees were removed within twenty working days after detection of the disease, instead of waiting to remove them during the fall and winter months. This intensified effort reduced the incidence of DED by 1.2 percent the first year, 2.4 percent the second year, and 6.7 percent the third year (1977).

The cost of intensified sanitation was evaluated and results showed that over three years, there was a dollar savings of approximately twenty-five percent and a saving of an additional ninety-two trees per thousand in the elm population.

GRAFT INOCULATIONS FOR DED

Dutch elm disease (DED) and phloem necrosis are the two most serious diseases of elms in the United States. Certain American elm selections and European and Asiatic species and hybrids have shown resistance to DED, but none have been adequately tested for resistance to elm phloem necrosis. After repeated graft inoculations of some of

those with phloem necrosis, we have found that urban elm (Ulmus pumila x U. Hollandica), Ulmus Wilsoniana, and U. pumila, have exhibited no susceptibility. On the other hand, a promising DED resistant American elm selection clone 368 x R182 was found to be susceptible in 1978 following inoculation in 1977.

This information is important to tree breeders, foresters, arborists, and pathologists interested in developing and providing disease resistant trees to the general public.

SPRUCE BUDWORM

Spruce budworms have infested approximately 150 million acres in Eastern North America and approximately 10 million acres in Western North America. To combat this outbreak, the Canada-U.S. Spruce Budworms Program was organized in August 1977 with the Northeastern Forest Experiment Station as lead station for the eastern component.

TRAINING GUIDE FOR POPULATION STUDIES

Survey entomologists and pest managers routinely sample branches from host trees and bring them for examination to the laboratory for Spruce Budworm population studies. A training guide has been produced to aid egg mass examiners in the basic steps needed to examine foliage, including "do's" and "don'ts," safety precautions, equipment needs, and other helpful hints.

TREATMENT

Studies conducted in Maine of stands unprotected and protected by aerially applied chemicals have shown there are substantial differences in the mortality of unprotected mixed wood versus softwood stands. The studies have shown that spruce mortality is slight. Suggested treatment is based on economic values gained from protection by applying differential protection strategies on a stand-by-stand basis.

Because of the variation in response of spruce in the red/black spruce hybrid array, studies suggest that a best tree for propagation and planting relative to budworm attack can be selected.

GYPSY MOTH

The northeastern forest has a variety of woodland related values that varies dramatically when insects change in number and/or behavior. The gypsy moth threatens high priority recreational areas, urban property, and timber resources in this forest region.

GYPSY MOTH PEST MANAGEMENT DECISION SYSTEM

A prototype management decision system has been developed to suppress, control, and contain the gypsy moth. This management prototype represents the first large-scale decision-making system for pest managers over a multi-state region to control a forest urban insect. The decision to use a particular type of system will depend on the objective chosen--eradication, containment, and/or suppression. Methods for implementation will be included and a monitoring feedback system will be a vital part of this program.

SAMPLING METHODS FOR PEST MANAGERS

Pest managers need efficient sampling methods to gauge insect numbers and decision-making techniques to aid in determining a feasible course of action. These methods must be efficient and reliable. Pest management personnel now have a statistically sound method for enumerating gypsy moth egg mass densities in forested areas. This method utilizes a small, fixed circular ground plot for observing egg masses on undergrowth, down trees, and litter. In addition, a variable radius prism plot is used to select live trees for observing egg masses. The details of the fixed- and variable-radius plots (FVP) sampling method for gypsy moth egg masses are described in a new USDA handbook.

SURFACE MINING

Research at the Station has aimed at reducing damage to the environment and forest resources due to strip mine operations and restoring already mined land to produce water, timber, wildlife, range, recreation, and other benefits.

SURFACE MINE SPOILS MEASUREMENT

Research results indicate that conventional soil mechanics tests are reliable for describing shear strength and permeability of mine spoils. Shear strength of a mine spoil is related to its dry density, moisture content, and plasticity index. Spoil properties dictate how the spoil mass will behave after mining and reclamation, and provide an indication of the revegetation potential. Physical, chemical, and mineralogical properties are all important. These findings are useful to researchers, government agencies, and the coal industry in developing mining and reclamation plans and regulations.

REVEGETATION

Vegetation of steep slopes and toxic spoils often requires the application of soil amendments, planting of acid-tolerant species, and the introduction of beneficial microorganisms.

Researchers found that vegetation can be established at an increased rate, including a doubled herbage yield, with the combined use of lime, fertilizer, and mulch. Mulches on steep slopes and dark-colored toxic spoils aided establishment of seeded species by reducing surface erosion and lowering soil temperatures. Tree leaves mixed into the mine spoils provided benefits similar to bark and hay mulches.

After ten years, trees planted with a legume cover are now taller than trees planted with grass or no herbaceous cover. Pine and hardwoods interplanted with black alder are now larger than trees planted without alder.

MULCHING FOR SURVIVAL OF HARDWOODS ON MINE SPOILS

Hay, bark, and straw mulches generally help promote the establishment of vegetation on strip mined land while wood chips and hydromulch generally are of little value. Regulatory agencies in several states now approve the use of shredded hardwood bark as mulch. Preliminary results indicate that composite municipal waste also may be valuable in mined land rehabilitation. Chemical soil stabilizers alone or in combination with mulching materials provide effective treatments for erosion control.

Data from Kentucky indicate that mulching with wood bark increases survival of some hardwoods planted on mine spoils.

WILDLIFE HABITAT HANDBOOK FOR LAND OWNERS AND MINE OPERATORS

A "Guide for Vegetating Surface-Mined Lands for Wildlife in Eastern Kentucky and West Virginia" has been prepared to help operators plan for wildlife in the rehabilitation of their mined land.

The guide lists plants suitable for revegetating surface mine sites, and identifies species tolerances to environmental factors common to surface mines. It discusses planting techniques, lists recommended seeding mixtures, and illustrates planting patterns beneficial to wildlife as well as providing information on sources of planting stock.

HARDWOOD TIMBER HARVESTING

CABLE LOGGING IN EASTERN FORESTS

It has been demonstrated that skyline systems can reduce the environmental impacts of timber harvest, but it remains to be proven that skyline systems are an economically viable alternative to existing skidding systems in

the East. Two years of experience on the Fernow Experimental Forest and observation of other cable systems provide insight on systems suitable for timber harvest in the Appalachians.

A running skyline--one that can be raised or lowered at will--with a swinging boom seems best for mountain hardwoods. Skyline spans and equipment should have the capability to yard 1,000 feet or more, but a 400 to 600 foot range will be used most often. The system should be light and mobile to operate on steep and narrow roads.

The region's timber values probably cannot support machines costing more than $100,000. Given these insights, it may be possible to adapt the sophisticated cable systems now used in the West to eastern timber and topography conditions.

BUILDING A PROTOTYPE CABLE YARDER

A patent has been applied for a cable yarder that was built as a prototype by researchers. This yarder can be utilized in thinning cuts and pulpwood operations where winch line pull does not exceed 6,000 pounds. Researchers think the yarder will create a one-piece equipment logging operation where the logger will be able to build roads, skid, and load timber with one machine.

WEAK LINK LOGGING SYSTEMS ANALYZER

A Weak Link Logging Systems Analyzer was developed to help loggers obtain information about logging operations. Loggers can use this analyzer to estimate the productivity of each component in their system, locate bottlenecks, and estimate logging costs. The Systems Analyzer is accomplished through nomograms that enable loggers to evaluate a wide variety of machine combinations and operating conditions.

The application of Weak Link is being promoted through workshops for loggers and service foresters. These workshops explain how the system is applied and how it can be adapted to variations in logging conditions.

FOREST RECREATION

CAMPING IMAGES

A nationwide sample survey of households asked if camping was interesting, friendly, refreshing, inexpensive, easy, fun, convenient, clean, safe, uncrowded, pleasant, or comfortable. Images of camping's attraction and environment were compared for several different population groups, including potential campers, active campers, and inactive campers.

It was found that camping's appeal was strongest among heads of households under thirty years of age. Unfavorable images--expensive, dirty, crowded, and inconvenient--were seen as barriers to potential campers. Unless problems resulting from camping's popularity are recognized and resolved, images of camping may further deteriorate.

NATIONAL CAMPING INDICATORS PROGRAM

Representing a public-private cooperation jointly developed and sponsored by NCOA, the campground publishing industry, the Northeastern Forest Experiment Station, and the University of Vermont, this project sponsored the development of two nationwide indicators of camping activity.

The National Campground Occupancy Index served as a barometer of camping activity at more than 10,000 commercial campgrounds and was based on weekly occupancy reports provided by cooperating private campgrounds. Data was matched by computer with previously reported figures on capacity, types of facilities, years in business, and fees to provide a sound basis for comparisons and trend measurement.

The National Camper Satisfaction Index monitored the quality of camping experiences provided at these campgrounds and was developed from a simple report card evaluation of experiences provided by the campers. Cooperating campgrounds received a computer printout comparing the reaction of campers at their campgrounds with those of others in the sample.

NATIONAL SKIER MARKET SURVEY

This comprehensive examination of a major outdoor recreation market was conducted cooperatively by the Northeastern Forest Experiment Station, USDA Forest Service, and Cornell University. A survey of potential, active, and inactive skiers provided data of detailed descriptions of public images of and attitudes towards skiing, its costs, attractions, facilities, and market needs as well as sizes of various skier markets. For the first time, public and private planners and developers of skiing facilities have an objective estimate of the skier market's potential for short-term growth, both regionally and nationally. An assessment of the adequacy of existing developed ski areas was also provided.

In terms of development costs, operational costs, and investment risks, skiing is probably one of outdoor recreation's best consumer bargains and could be more effectively promoted. Skiing's highly popular appeal to all age groups should be developed through local efforts and on-the-ground contact rather than industry-wide promotional campaigns.

WASTE COMPOSTING METHODS

Because of health hazards, disposal of human waste has been one of the most critical problems for backcountry managers. In the 1930s, only one or two visitors per night used backcountry facilities, but today these same areas average ten to twenty visitors per night.

A short-term solution to this problem has been the relocation of privies. With the requirement that soil beneath a privy must be at least four to five feet deep, this solution is limited by the number of possible privy sites.

Researchers have developed a simple bin composter to compost privy wastes mixed with ground bark in a closed container. The decomposition process takes about two weeks and the end product is a humuslike substance, free of pathogens and odor. The compost bin can be maintained easily by regular field crews and the cost per unit is $100.

SUGAR MAPLE

REDUCE FUEL COSTS FOR SYRUP PRODUCERS

Our researchers studied the engineering and economic effects of heat exchangers using steam that would have been lost in the evaporation process to preheat incoming sap. This study found that efficiency was increased by 15 to 17 percent with heat exchangers. Syrup produced in evaporators with heat exchangers was similar in flavor and composition to syrup produced in conventional systems, and heat exchangers can reduce production costs. The study also found that use of heat exchangers will give the sugarhouse a supply of hot water and yield greater production and higher profits.

DISCOLORATION AND DECAY IN TAPPED SUGAR MAPLE

Studies in Maine, Michigan, New York, Pennsylvania, and Vermont indicate that repeated use of paraformaldehyde within tapholes leads to rapid development of decay in sugar maple trees.

VAPOR COMPRESSION DISTILLER OR OPEN-PAN EVAPORATORS

Although mechanical compression distillation had been used for desalinization since World War II, its potential for processing maple sap had not been investigated. Researchers tested vapor compression distillers for processing maple syrup and found that vapor compression equipment evaporated one pound of water with .047 pounds of steam equivalent (electrical energy); open-pan evaporators of similar capacity required 1.5 pounds of steam equivalent (oil energy) to produce one pound of water; vapor compression evaporation produced syrup of equal quality to that from conventional open-pan evaporation; and a central plant producing 8,000 gallons of syrup per year should yield a return of sixteen percent on investment. Increasing annual syrup output should increase the return on investment. Vapor compression distillers provide an alternative to the energy intensive conventional open-pan evaporation system for the large centralized syrup-processing plant.

URBAN FORESTRY

URBAN FOREST VALUES

With the current rapid increase in land values near urban areas, there is a decrease in forest investments. Timber management is a declining factor in real estate transactions.

Research shows that urban people attach high property values to trees around homes. These studies also show that real estate developers can preserve trees around homes at a low cost relative to their value, but many developers lack the technical knowledge to preserve trees in a healthy condition.

There is a need and opportunity for service, extension, and consulting foresters to help developers preserve trees around homes. This kind of cooperation will produce both economic and environmental benefits.

SQUIRREL HABITAT IN URBAN AREAS

Gray squirrels provide pleasant opportunities for some city residents to interact with something wild. In Springfield, Massachusetts, squirrel activity was recorded during a three-year study of seventy-five plots in five habitat areas.

Highly urbanized areas with tree-lined streets had low squirrel numbers as compared to rural habitats. In forested city areas, squirrel abundance was estimated to be about two squirrels per acre, the same as for rural forests. Parks, college campuses, and cemeteries created a habitat that resulted in more squirrels than were found in rural forests.

FOREST MANAGEMENT

SELECTION SILVICULTURE

Potential users of selection silviculture in spruce/fir stands can now compare early results from this system

with unregulated harvesting (commercial clearcutting) and no management for wood products (woodland preserve or wilderness).

Twenty years of records indicate that spruce/fir stands will respond to the selection system of silviculture. Records also show that stand quality in the selection system is improved, species composition can be altered, diameter-class distribution approaches a stated goal, stand density is controlled, and yields are increased.

The lack of direct comparisons between selection silvicultural management and no management in spruce/fir has been partly responsible for the limited acceptance of the method in the past.

EARLY RELEASE OF HARDWOODS

Based on a five-year study, Appalachian hardwood forest managers should not plan to select and release yellow-poplar, red oak, black cherry, or sugar maple crop trees at a very young age. In most instances the released crop trees do not grow any better than the nonreleased crop trees. Knowing this, public and private land managers are now investing their money in other cultural practices.

PLANTING SITES FOR BLACK WALNUT

Thirteen years after black walnut and northern red oak were planted on a clearcut oak site, researchers found that black walnut seedlings could be established and grown if planted on the best sites and with control of competing competition. Planted stock cannot compete successfully with other fast growing trees, shrubs, and sprouts with established root systems.

Northern red oak seedlings failed to develop satisfactorily regardless of treatments or the site quality.

Proper selection of planting site and adequate control of competing vegetation are extremely important if foresters are to be successful with black walnut on recently clearcut upland oak sites.

IDENTIFYING TREE QUALITY AT AN EARLY AGE

Some important factors that determine the value of standing timber are species, size, and stem quality. In young precommercial size stands, there is no standard or system for evaluating individual trees for their potential to produce high quality hardwood products. Recently, scientists developed a system to classify trees into quality classes based on tree and stem characteristics. This system is independent of product specifications and is designed to identify tree quality at an early age. This procedure will enable the forest manager to apply cultural treatments, such as thinning and pruning, that will increase the number of high quality trees and the harvest value.

TOXIC CHEMICALS FROM HERBACEOUS PLANTS PREVENT BLACK CHERRY REGENERATION

Low density cherry/maple orchard stands and treeless plains on the Allegheny Plateau in northwestern Pennsylvania developed following turn-of-the-century cuttings, fires, and deer browsing. With a ground cover of fern, grass, goldenrod, and aster, these areas failed to regenerate because biochemicals toxic to cherry and other hardwoods were released from the foliage and roots of these herbaceous plants.

Following shelterwood cutting of Allegheny hardwood stands on poorly drained sites, woodland species of ferns and grass spread rapidly, dominating the site within several years. Toxic biochemicals from these species also interfered with growth of black cherry and other hardwoods during stand regeneration.

Through studies in progress, forest land managers can now better predict success or failure of regeneration prescriptions based upon the amount of herbaceous vegetation present before or at the time of cutting.

Basic biological knowledge about the release and fate of toxic biochemicals (the phenomenon of allelopathy) are helping to bring a new understanding of the forest regeneration process.

STOCKING GUIDES FOR ALLEGHENY HARDWOODS

Control of stand density is the principal means foresters use for regulating stand growth. Through the years many stocking guides have been developed to aid in judging how well a stand is stocked compared to a prescribed standard.

A new stocking guide has been developed for stands of Allegheny hardwoods that contain mixtures of black cherry, red maple, sugar maple, beech, white ash, birch, and other species. This guide incorporates, for the first time, a measure of species composition necessary because of the widely different growing space requirements. This guide permits accurate evaluation of Allegheny hardwood stocking, and provides a sound basis for determining minimal residual densities to leave after thinning or selection cuttings.

RELATION OF SPECIES TO HABITAT

Eleven different forest habitats were studied and defined for areas of granitic drift in the White Mountains of New Hampshire. Species varied with different soil materials. Successional beech/sugar maple/yellow birch stands characterize the fine till soils and the enriched, or cove sites, where White ash also is common. Beech, birch, and red maple predominate in stands on washed fine till and coarse till soils. Red maple is the most abundant species on sandy sediments, silty sediments, and dry compact till soil. Softwoods, especially red spruce and eastern hemlock, characterize habitats having poor drainage, shallow soils, outwash, or wet compact till.

A previous study in old stands indicates that pure hardwood stands occur only on coarse till, fine till, and enriched sites. On most of the other habitats, the hardwood cover tends to change gradually to softwoods. Site index generally averages highest on strong hardwood habitats and the lowest on strong softwood habitats, although the site index of red maple remains comparatively high even on strong softwood sites. Habitat classification should be used in conjunction with gradient analysis to analyze or depict the relationships of forest vegetation to environmental conditions.

AIR POLLUTION

NEEDLE MOTTLE IN EASTERN WHITE PINE SEEDLINGS: A SELECTION PROCESS FOR AIR POLLUTION TOLERANCE

Studies show positive correlations between morphological characteristics in eastern white pine (Pinus strobus L.) and seedling sensitivity to air pollution. Of eleven plant variables, needle mottling of two-year-old white pines was an indicator of susceptibility to air pollution. This foliar characteristic allows for detection and removal of genetically susceptible seedlings in the nursery during grading. Stability of pollution response during various ontogenetic stages will aid in selection of tolerant seed sources and seedlings of white pine.

EFFECTS OF AIRBORNE CONTAMINANTS ON EASTERN FORESTS

The Hubbard Brook Experimental Forest in New Hampshire is an international focal point for ecosystem research and a place where airborne pollutants come to rest. Gases and particles from the combustion of fossil fuels in areas to the west cause formation of acidic pollutants that tend to fall out of the air over the Northeast. Sulphur is a particular culprit, and tests at Hubbard Brook have shown that sulphur content of the air and the prevalence of acidic precipitation, "acid rain," are closely correlated. Unfortunately the highest levels of this fallout occur during the summer months when its potential to adversely affect plant growth is greatest.

WATERSHED MANAGEMENT

EFFECTS ON STREAMFLOW FROM USE AND LOCATION OF LOGGING ROADS

Watershed 2 on the Fernow Experimental Forest has been logged four times since the turn of the century. The scant

evidence available suggests no major effects on stream flow after high grading the old growth hardwood in 1905 or after harvesting blight-killed chestnut during World War II. The effects of diameter-limit harvest in 1958 and 1972 are well documented. Both cuts caused small increases in stream flow that lasted for no more than two years. Water quality was unaffected except for temporarily increased turbidity caused by improper use and location of logging roads. The evidence suggests that continued diameter-limit harvest will not harm forest streams if responsible road practices are followed.

USE OF FOREST LAND FOR DISPOSAL OF SEWAGE SLUDGE

Forests may be used as an intentional dump for wastes such as sewage sludge. Dewatered sewage sludge was applied at rates of 25 to 125 metric tons/hectare (t/ha) to the forest floor at Hubbard Brook. The light application of sludge had little effect on soil water chemistry, but the 125 t/ha treatment tripled concentrations of some nutrients for up to one year. Based on knowledge of the Hubbard Brook Ecosystem, it was concluded that an intermediate rate of 75 t/ha could be applied without releasing nutrients to streams or affecting ecosystem function.

INSECTS AND DISEASES

DECAY RESISTANT TREES

Results of recent research indicate that it is now possible to make selections within a species for decay resistance. Decay resistance here is defined as resistance to spread, rather than resistance to infection. Using the CODIT model for compartmentalization of decay in living trees, it is possible to select trees within a species that wall-off or compartmentalize defects to very small volumes. It appears that this intrinsic capacity for effectively compartmentalizing is under genetic control. This means we can now select trees that can be wounded repeatedly but will still respond so effectively that even when defect columns develop, they will be very small. We see this as a major breakthrough in the field of forestry.

OAK BORER CONTROL KEEPS WORKING

Silvicultural control of the red oak borer produced an immediate reduction of 66 percent damage on test plots in southern Ohio. Borer damage has continued to decline and four years after treatment, the damage to stands is ten percent of the pretreatment level. Untreated stands show a twenty percent increase over the same time span. This research makes possible a dramatic reduction of oak timber quality loss, estimated at over $100 million annually throughout 140 million acres of eastern oak forests.

FOREST BIOLOGY

FUTURE GROWTH POTENTIAL OF TREE SEEDLINGS

Analysis of the growth of Picea abies seedlings suggests the possibility of predicting the future growth potential of tree seedlings on the basis of early growth features.

In tree seedlings, all new leaves and stem segments have their beginnings in the mass of growing and dividing cells at the stem--the apical meristem. Though the cells in this dome-shaped region typically produce about twenty-five percent of their own volume of new growth per day, the volume of this small dome itself increases very slowly.

Methods have been developed to calculate the absolute and relative growth rates of apical meristems of conifer seedlings. Researchers have found that the relative growth rate varies little with seedling age whereas the absolute growth is largely determined by the apical dome volume. That volume, in turn, is determined by how much new growth is reinvested in the dome itself increasing the capital volume. The investment ratio can be as high as thirty percent, but it can be as low as zero, or even negative.

There are good reasons for believing that in their future growth young seedlings with high investment ratios

will outperform those with low ratios. Further research is needed to learn how the investment ratio may be controlled.

MYCORRHIZAE

Studies on the biochemical-physiological effects of growth substances in ectomycorrhizae of Pinus virginiana, have shown that only a few species of fungi tested have metabolic activity and that hormones are not consistently produced. Various amounts of synthetic hormones and indoleacetic acid may produce changes similar to those in natural ectomycorrhizal associations. The presence of the fungi consistently reduced the rate of metabolism of soybean callus tissue and fungal metabolic products may be a key to increased long life of mycorrhizal roots.

FOREST ECONOMICS

AUTOMATED MANAGEMENT PLANNING SYSTEM (AMPS) FOR THE SMALL-FOREST LAND OWNER

AMPS is designed with two people in mind: the practicing forester and the small-forest land owner. It relieves the forester of computational drudgery and offers more time for exercising professional skills. It allows the owner to incorporate wants and needs into the management planning process for the small-forest.

AMPS, a flexible package of optional subsystems, provides summaries of forest inventory data, estimates of forest values, a series of cutting strategy simulators, an economic analysis, growth projections, and a listing of possible markets. The user may select, as output, various combinations to tailor a management plan to both individual woodlots and individual owners.

AMPS is being field tested by the Indiana Department of Natural Resources. It is also an integral part of FACTS: Fast Agriculture Communications Network System, a statewide network of computer terminals that will soon link the Purdue University Agricultural Experiment Station with each county extension office in Indiana.

FOREST LAND USE DECISIONS

The ability to gauge the capacity of forest resource to satisfy future timber requirements is needed to solve problems arising from competition for use of forest land. Potential timber production under management alternatives has been weighed against estimates of timber requirements for the year 2000. By depicting the capabilities filling timber requirements in different parts of the region, these analyses indicate areas that will be affected by further shifts toward nontimber use of forest land.

One option combines forest management at the present level with emphasis on harvesting the best timber-growing sites first. Under this type of forest management, projected timber requirements for the year 2000 could be met from roughly half the region's commercial forest area. By allowing flexibility in forest land use decisions, the forest could accommodate both intensive management and multiple use objectives.

UTILIZATION

HARDWOOD LOGGING RESIDUES

Researchers determined the need for more information on the yields of useable products that could be recovered from residue hardwood. A study was made to find the potential yields for different levels of harvesting intensity on a clear-cut cove hardwood sawtimber stand in western Virginia. This information will aid in finding economical ways to recover and use residues that will help increase the nation's wood supply (without cutting additional timber), while reducing the environmental impact of logging and the cost of forest regeneration.

NEW USE FOR LOW GRADE HARDWOODS

Furniture manufacturers have considered number 2 Common and lower grades of lumber undesirable because the

lower grades of lumber do not yield the longer length cuttings desired by the furniture industry.

In an attempt to increase the use of lower grades of fine hardwood lumber, researchers have developed a new method of end joining pieces of wood. This end joining process is called Serpentine End Matching (Sem). The glue line of this joint is described as a sine wave that resembles the grain pattern of flat sawn wood and allows the joint to be camouflaged.

Furniture industries have shown a great deal of interest in this new process that will allow them to use the lower grades of hardwood lumber that have been considered undesirable.

HARDWOOD BARK HELPS HEAL SCARRED LANDSCAPES

Shredded hardwood bark makes a high quality mulch for controlling erosion and establishing vegetation on disturbed soils. Because shredded bark resists movement by heavy rains and winds and needs no asphalt to hold it in place, bark is particularly suitable for mulching grass-legume seedings on highway roadsides and surface mined areas. These applications are high volume uses for hardwood bark and are resulting in new markets for bark residues generated at log processing plants. A bark mulch plant has been established in south central West Virginia and provides a market for a previous waste material from numerous area sawmills.

Guidelines for preparing mulch specifications and shredded hardwood bark have been prepared and broad scope plan for application is being implemented. Specialized equipment for transporting and applying bark mulches and wood residues has been evaluated for performance and costs.

STATION BIBLIOGRAPHY

The Station Bibliography contains all publications actually published during 1977 and 1978 by the Northeastern Forest Experiment Station. Publications are classified in the six major research areas:

A. FOREST ENVIRONMENT RESEARCH

1. Watershed Management Research

3, 81, 82, 83, 84, 90, 91, 92, 93, 94, 106, 133, 144, 145, 146, 212, 232, 236, 237, 238, 239, 244, 259, 276, 277, 281, 310, 311, 312, 313, 314, 320, 321, 322, 323, 333, 353, 373, 377, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 405, 410, 413, 414, 415, 416, 417, 429, 445, 520, 521, 530, 542, 544, 555.

2. Wildlife Habitat Research

86, 87, 96, 109, 115, 223, 295, 297, 324, 407, 422, 508, 509, 510, 537, 579.

4. Fisheries Habitat Research

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5. Forest Recreation Research

25, 31, 78, 83, 119, 134, 139, 140, 142, 143, 184, 185, 186, 187, 188, 227, 290, 291, 292, 293, 294, 304, 305, 306, 307, 315, 319, 326, 327, 334, 361, 362, 367, 372, 385, 407, 419, 506, 522, 556, 557, 558, 559, 560.

6. Urban Forestry

8, 12, 24, 25, 36, 38, 53, 54, 55, 70, 71, 72, 78, 80, 110, 111, 112, 113, 114, 116, 117, 118, 136, 140, 141, 179, 190, 219, 224, 225, 229, 230, 231, 258, 271, 278, 319, 325, 332, 339, 349, 354, 358, 359, 360, 361, 365, 366, 368, 369, 373, 375, 377, 381, 383, 385, 389, 406, 418, 426, 431, 441, 464, 465, 497, 498, 506, 512, 513, 521, 523, 529, 541, 551, 552, 553, 564, 582, 589.

B. FOREST INSECT AND DISEASE RESEARCH

1. Forest Insect Research

4, 13, 15, 16, 17, 34, 58, 60, 61, 62, 63, 64, 65, 66, 68, 97, 98, 108, 120, 121, 127, 128, 130, 159, 160, 161, 181, 182, 189, 192, 219, 220, 221, 246, 248, 249, 250, 251, 252, 253, 263, 264, 288, 289, 295, 296, 297, 308, 309, 330, 331, 343, 344, 363, 364, 370, 374, 378, 388, 412, 420, 421, 430, 433, 527, 528, 531, 533, 534, 535, 536, 538, 549, 570, 583, 588.

2. Forest Disease Research

5, 14, 26, 27, 28, 29, 30, 39, 40, 56, 59, 67, 85, 122, 123, 124, 125, 126, 147, 150, 175, 180, 183, 199, 200, 222, 245, 246, 247, 265, 266, 267, 268, 282, 328, 355, 371, 376, 389, 391, 392, 404, 423, 424, 432, 433, 434, 439, 452, 457, 458, 466, 467, 468, 469, 470, 471, 472, 473, 474, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 498, 512, 568, 571, 572, 573, 574.

C. FOREST FIRE AND ATMOSPHERIC SCIENCES RESEARCH

4. Ecological Relationships

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5. Weather Modification and Weather Effects

8, 38, 53, 55, 95, 124, 126, 141, 224, 226, 258, 271, 330, 332, 339, 352, 389, 426, 458, 459, 497, 512, 513, 529, 553, 589.

D. TIMBER MANAGEMENT RESEARCH

1. Biological Relationships

11, 37, 41, 61, 75, 99, 102, 106, 122, 126, 129, 153, 193, 195, 202, 203, 205, 206, 207, 208, 209, 210, 235, 240, 241, 242, 243, 244, 248, 254, 255, 256, 257, 260, 269, 270, 272, 279, 280, 283, 284, 300, 312, 333, 336, 337, 342, 346, 350, 351, 369, 390, 411, 427, 428, 433, 442, 443, 444, 445, 458, 507, 511, 532, 548, 550, 566, 570, 577, 584.

2. Silviculture

99, 100, 101, 103, 104, 148, 149, 150, 154, 155, 162, 194, 201, 204, 233, 237, 255, 261, 262, 285, 286, 287, 299, 300, 302, 303, 323, 335, 384, 440, 447, 448, 499, 500, 501, 502, 504, 505, 514, 515, 516, 517, 518, 519, 520, 542, 554, 577.

3. Management and Mensuration

9, 10, 75, 77, 86, 107, 234, 298, 301, 345, 387, 440, 446, 454, 456, 526, 578, 590.

4. Genetics and Tree Improvement

105, 157, 172, 173, 174, 175, 179, 201, 211, 317, 318, 335, 338, 451, 455, 483, 484, 576, 580, 581.

5. Special Products

69, 156, 158, 403, 567, 568, 569.

E. FOREST ECONOMICS AND MARKETING RESEARCH

1. Forest Resource Evaluation

1, 2, 18, 19, 20, 21, 22, 23, 35, 42, 43, 45, 46, 47, 48, 49, 50, 51, 52, 138, 167, 191, 273, 274, 275, 340, 341, 408, 409, 425, 450, 543, 548.

2. Forest Economics Research

44, 67, 107, 135, 162, 163, 165, 166, 168, 171, 196, 197, 198, 216, 217, 228, 329, 345, 347, 356, 357, 380, 407, 453, 454, 460, 524, 525, 526, 545. 546, 547, 585, 586, 587.

3. Forest Products Marketing Research

57, 131, 132, 137, 164, 169, 170, 215, 218, 292, 294, 348, 379, 461, 462, 463, 539, 540, 565, 566.

F. FOREST PRODUCTS AND ENGINEERING RESEARCH

1. Forest Engineering Research

32, 33, 95, 151, 152, 276, 397, 503, 578.

2. Forest Products Utilization Research

6, 7, 73, 79, 88, 89, 176, 177, 213, 214, 218, 435, 436, 437, 438, 449, 539, 540, 562, 563, 575.

1. Adams, Edward L., and Daniel E. Dunmire.
1977. SOLVE II: A technique to improve efficiency and solve problems in hardwood sawmills. U.S. Dep. Agric. For. Serv. Res. Pap. NE-382. 19 p.

A general description of a computerized technique for analyzing hardwood sawmills. Included are discussions of the input data, the resulting analytical information, and examples of how this information can be used by a mill manager. The technique gives the manager an economic and noneconomic analysis of his sawmill's operation.

2. Adams, Edward L., and Daniel E. Dunmire.
1978. SOLVE II USERS MANUAL: A procedural guide for a sawmill analysis. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-44. 18 p., illus.

A procedural guide for using the SOLVE II computerized technique to analyze hardwood sawmills. Included are discussions of: (1) analysis design, (2) data collection, and (3) computer card preparation and use. By following this guide, sawmill analysts should have little difficulty in using the technique.

3. Allaire, Pierre N.
1978. Reclaimed surface mines: new potential for some North American birds. Am. Birds 32(1): 3-5.

4. Anderson, J., M.A. Hoy, and R.M. Weseloh.
1977. Field cage assessment of the potential for establishment of Rogas indiscretus against the gypsy moth. Environ. Entomol. 6: 375-380.

5. Anderson, Robert L., and Leon S. Dochinger.
1978. How to identify white pine susceptible to air pollution. U.S. Dep. Agric., Northeast. Area, State and Priv. For. 4 p.

6. Araman, Philip A.
1977. Use of computer simulation in designing and evaluating a proposed rough mill for furniture interior parts. U.S. Dep. Agric. For. Serv. Res. Pap. NE-361. 9 p., illus.

The design of a rough mill for the production of interior furniture parts is used to illustrate a simulation technique for analyzing and evaluating established and proposed sequential production systems. Distributions representing the real-world random characteristics of lumber and equipment feed speeds and delay times are programed into the simulation.

7. Araman, Philip A.
1977. Converting low-grade yellow-poplar lumber into furniture dimension stock. Proc. 5th Annu. Hardwood Symp. Hardwood Res. Counc. p. 74-80.

Low-grade yellow-poplar lumber was converted into lumber core furniture material and interior parts by several roughmill cut-up methods. The least-cost grade for core material was 2A Common lumber and either 2B or 2A Common should be used for interior parts. Manufacturing sequences that use gang-ripping first should be seriously considered when planning a new facility to produce core material and/or interior parts.

8. Arens, Edward and Donald Ballanti.
1977. Outdoor comfort of pedestrians in cities. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 115-129.

The outdoor comfort of pedestrians has been neglected by architects and planners because of difficulties in determining comfortable and uncomfortable climatic conditions and predicting the climatic characteristics of a planned urban site. Available information on comfort in a cold environment is summarized. The mechanical effects of wind on comfort are better understood than the thermal effects of climate and have proved to be practical criteria for assessing pedestrian comfort in designs. Climate-prediction techniques and a procedure for determining the probability of discomfort on a proposed site are described.

9. Auchmoody, L. R.
1977. Influence of mortality in evaluating forest growth responses to fertilization. Agron. Abstr. 1977 Annu. Meet. Los Angeles, Calif. p. 180.

10. Auchmoody, L. R.
1978. Hardwood fertilization progress: Allegheny and Appalachian areas. Allegheny News, Soc. Am. For. p. 10-11.

11. Auchmoody, L.R., and H. Clay Smith.
1977. Response of yellow-poplar and red oak to fertilization in West Virginia. Soil Sci. Soc. Am. J. 41: 803-807, illus.

Fertilization tests with small sawlog-size yellow-poplar and red oak were begun in the northern mountain section of West Virginia in the spring of 1970. During the first year, N was broadcast at 336 kg/ha, P at 97 kg/ha, and K at 93 kg/ha, in the second season, 112 kg/ha of N and 97 kg/ha of P. In response to N over a 3-year period there was a 47% increase in basal area of yellow-poplar and a 29% increase in red oak. There was no response to P, either alone or in combination with N. Negative effects on basal-area growth were observed where KCI was applied. Foliar response in leaf weight and color was attributed mostly to N, although P in combination with N produced slightly heavier and darker green leaves than N alone. Foliar N in yellow-poplar corresponding to the best basal-area growth was about 3.0% N.

12. Aylor, Donald E.
1977. Some physical and psychological aspects of noise attenuation by vegetation. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 229-233.

The physical mechanisms governing sound attenuation by foliage, stems and ground are reviewed. Reflection of sound energy is found to be the primary mechanism. In addition, new experimental results are discussed that help to quantify the psychological effect of a plant

barrier on perceived noise level. Listeners judged the loudness of noise transmitted through hemlock trees and through a minimal fence barrier to differ by as much as 7 dB even though the sound level at the listener was the same.

13. Bahr, G.F., W.F. Engler, and H.M. Mazzone.
1976. Determination of the mass of viruses by quantitative electron microscopy. Q. Rev. Biophys. 9: 459-489.

A transmission electron microscopy procedure was evaluated for its capacity to obtain the mass value of viruses. The transmission value through the image of virus particles recorded on a plate or film is measured and compared to that through the image of a standard particle whose mass is known; the mass value of the virus particles is determined and an average mass calculated. Among the viruses analyzed were the nucleopolyhedrosis viruses of the gypsy moth (Lymantria dispar, Linnaeus) and the European pine sawfly (Neodiprion sertifer, Geoffroy). The mass value data were required for registration of the insect viruses by the Environmental Protection Agency.

14. Barger Jack H.
1977. Improved sanitation practice for control of Dutch elm disease. U.S. Dep. Agric. For. Serv. Res. Pap. NE-386. 4 p.

In Detroit, Michigan, 12 plots, each containing about 600 American elm trees, Ulmus americana L., were subjected for 3 years to intensive and conventional sanitation treatments to control Dutch elm disease. In the intensive treatment, three disease surveys were conducted each year; each followed by tree removal within 20 working days. In the conventional treatment, one survey was conducted each year, and diseased trees were removed in late fall and winter. Results showed that the intensive sanitation treatment was significantly better than the conventional treatment each year.

15. Barger, Jack H.
1978. Smaller European elm bark beetle panel tests, 1975. Insecticide and Acaricide Tests 3: 143.

16. Barger, Jack H.
1978. Smaller European elm bark beetle elm bole bioassay tests, 1976. Insecticide and Acaricide Tests 3: 142.

17. Barger, Jack H., David P. Worley, and William N. Cannon, Jr.
1977. Effective Dutch elm disease control by early discovery and quick removal. In Proc. 32nd Annu. Conf. Dutch Elm Dis. Coop. Ext. Serv. Univ. Mass. Coop. Mass. For. Park Assoc. Oct. 5, 1977, Waltham, Mass. p. 6-12.

In Detroit, Michigan, 12 plots, each containing about 600 American elm trees, received intensive or conventional sanitation treatments over a 3-year period. In the intensive treatment on six plots, three disease surveys were conducted each year, each followed by tree removal within 20 working days. In the conventional treatment on six plots, one survey was conducted each year, and diseased trees were removed in late fall and winter. The survival of elms under the intensive treatment was significantly superior to that under the conventional treatment over all 3 years.

18. Barnard, Joseph E.
1978. Example of a specific regional inventory: The United States northeastern double sampling with partial replacement design. Proc. Joint Meet. IUFRO Groups S4 02 and S4 04. Bucharest, 18-26 June, 1978. p. 620-628.

The application of double sampling with partial replacement to the reinventory of 105 million acres (42.5 million ha) in the northeastern United States is discussed. Specific details of the application are provided. Special considerations such as data processing and local data summaries also are discussed.

19. Barnard, Joseph E.
1978. The FINSYS data-processing system--development, maintenance, experience. In Application of electronic data processing in forest inventory. Working Group 2 4.02.4 IUFRO.

Forest-inventory data processing requires quick, low-cost procedures for developing desired information. A computer system--FINSYS--is presented here. It is a generalized system with the flexibility to allow the user to specify the procedures for both data handling and table construction. The components of the system are described, and its development and use since 1964 are discussed.

20. Barnard, Joseph E.
1978. A tool for the processing of integrated resource inventory data. In Proc. Integrated Inventories of Renewable Natural Resources Workshop. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. RM-55. p. 332-335.

21. Barnard, Joseph E. and J. David Born.
1978. FINSYS-2: Subsystem EDIT - 2. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-43. 68 p., illus.

A computer software package for the editing of resource inventory data is described. The flexibility of the system in performing user-designated functions also is described. Full instructions for the operation of the system are included.

22. Barnard, Joseph E., and Teresa M. Bowers.
1977. A preview of Kentucky's forest resource. U.S. Dep. Agric. For. Serv. Res. Note NE-234. 11 p.

Forty-eight percent of the total land area of Kentucky is forest. Sixty-three percent of this forest land is the oak-hickory forest type and 47 percent of the forest area supports sawtimber stands. There has been a 23-percent increase in the volume of growing stock and a 24-percent increase in the volume of sawtimber

since the 1963 inventory. Total volume of growing stock is 11.4 billion cubic feet, and the sawtimber component is 27.6 billion board feet.

23. Barnard, Joseph E. and Teresa M. Bowers.
1977. A preview of West Virginia's forest resource. U.S. Dep. Agric. For. Serv. Res. Note NE-249. 11 p.

Forest land occupies 75 percent of the total land area of West Virginia. Sixty percent of the forest land is classified in the oak-hickory forest type and only 6 percent in all the softwood forest types. Since 1961, growing-stock volume has increased 24 percent. Yellow-poplar increased 39 percent in volume and is now the prevalent species in the State.

24. Benjamin, John C., George H. Moeller, and Douglas A. Morrison.
1977. Measuring environmental attitudes of elementary school students. In Children, Nature, and the Urban Environment: Symp. Proc. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-30. p. 95-100, illus.

A modified semantic differential was developed to measure environmental attitudes of sixth-graders. Classes were selected to represent different socioeconomic and residence backgrounds and degrees of previous exposure to structured environmental programs. Results indicate that: exposure to environmental education fosters favorable environmental attitudes; socioeconomic background and exposure to environmental education do not influence attitudes toward familiar, nonwater natural elements; urban students from low socioeconomic neighborhoods are unfamiliar with natural processes involving water resources; attitudes most easily transferred identify man as a contributor to environmental problems; and attitudes most difficult to transfer deal with ecological processes. Results provide a way to measure children's environmental attitudes and suggest a way to develop environmental programs for specific student groups.

5. Berger, Michael L.
1977. Environmental perceptions of residents of a multifunctional building. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 377-381.

A multifunctional building in which residents could live, work, and entertain themselves without contact with the surrounding external urban environment is the subject of this study. To what extent do inhabitants of this structure perceive their thermal and acoustical environments within the building to be different from or similar to those outside? To what degree are discrete climatic and sound zones perceived within the structure itself? What factors account for such perceptions? Answers to these questions were provided by an analysis of the responses by 246 residents of the John Hancock Center in Chicago to a mail questionnaire.

6. Berry, Frederick H.
1977. Decay in yellow-poplar, maple, black gum, and ash in the central hardwood region. U.S. Dep. Agric. For. Serv. Res. Note. NE-242. 4 p.

In a study of decay in yellow-poplar (Liriodendron tulipifera L.), red maple(Acer rubrum L.), sugar maple (Acer saccharum Marsh.), black gum (Nyssa sylvatica Marsh.), and ash (Fraxinus spp.) in the central hardwood region, decay was found in 57 of 148 study trees. Extent of decay, causal fungi, and method of entry are discussed. The relationship between tree age and diameter and decay is also examined.

7. Berry, Frederick H.
1977. Decay in oak inoculated with four heart-rot fungi. (abstr.) Am. Phytopathol. Soc. Proc. 3: 215-216.

Three oak species--scarlet (Q. coccinea Muenchh.), black, (Q. velutina Lam.), and white (Q. alba L.)--were artificially inoculated with pure cultures of the heart-rot fungi Phlebia chrysocrea (Berk. et Curt. in Berk.) Burds.; Polyporus compactus Overh.; P. sulphureus Bull. ex. Fr.; and Poria andersonii (Ell. &

Ev.) Neuman. Five years after inoculation, 120 trees (half of those inoculated) were felled and cut into sections. There were no significant differences among the four species in the upward and downward rate of spread of the fungi from the point of inoculation; but there were differences in the total vertical spread of decay. Decay progresses most rapidly in scarlet oak; Phlebia chrysocrea caused the greatest amount of decay.

28. Berry, Frederick H.
1977. Control of walnut anthracnose with fungicides in a black walnut plantation. Plant Dis. Rep. 61: 378-379.

Benomyl, chlorothalonil, cupric hydroxide, dodine, and maneb were significantly more effective in controlling anthracnose (Gnomonia leptostyla) in a 7-year-old black walnut plantation than no treatment. Application of benomyl resulted in significantly less disease development than when the trees were sprayed with dodine, which is presently the only fungicide registered for control of walnut anthracnose.

29. Berry, Frederick H.
1978. Decay associated with borer wounds in living oaks. U.S. Dep. Agric. For. Serv. Res. Note NE-268. 2 p.

Wood-borer wounds serve as entry courts for decay fungi in oak species in the central hardwood region. Thirteen species of fungi were isolated from decayed areas surrounding borer galleries. Polyporus compactus was the most frequently isolated fungus, accounting for about 1/3 of the total decay volume caused by identified fungi.

30. Berry, Frederick H., and Frances F. Lombard.
1978. Basidiomycetes associated with decay of living oak trees. U.S. Dep. Agric. For. Serv. Res. Pap. NE-413. 8 p.

Thirty-one identified species of wood-rotting hymenomycetes were associated with decay and cull in upland oak stands in Illinois, Indiana, Kentucky, Missouri, and Ohio. Seven of these species produced brown rots that

accounted for a volume loss of approximately 381 ft^3 in the trees sampled. The remaining species produced white rots that were associated with a volume loss of approximately 557 ft^3. Stereum frustulatum, Inonotus andersonii, Polyporus compactus, S. gausapatum, and Phlebia chrysocrea were the most frequently encountered species, accounting for 70 percent of the white-rot infections; 79 percent of the brown-rot infections were caused by Laetiporus sulphureus, Poria oleracea, and P. cocos.

Bevins, M.I. and D.P. Wilcox.
1977. National market analysis: Developed camping and related activities, 93 pages (mimeo). Vermont Agric. Exp. Stn., Burlington.

Biller, Cleveland J.
1977. A hydraulic assist for a manual skyline lock. U.S. Dep. Agric. For. Serv. Res. Note NE-247. 2 p., illus.

A hydraulic locking mechanism was designed to replace the manual skyline lock on a small standing skyline with gravity carriage. It improved the efficiency of the operation by reducing setup and takedown times and reduced the hazard to the crew.

Biller, Cleveland J., and Harry G. Gibson.
1978. Testing the Chuball for selective logging on Appalachian slopes. North. Logger 26(12): 18-19, 34, illus.

The CHUBALL is an experimental logging device, a ball made of two hollow steel hemispheres joined so that each can rotate independently. The ball can be used for logging difficult slopes. Because it is spherical, it will bounce off obstacles as it rolls downhill to return the winch line to the choker setters. The tests showed that operating costs and safety limitations are major deterrents to its widespread use.

34. Birch, Martin C., Richard W. Bushing, Timothy D. Paine, Stephen L. Clement and P. Dean Smith.
1977. Pheromone traps to suppress populations of the smaller European elm bark beetle. Calif. Agric. 31(11):4-6.

35. Birch, Thomas W., and Neal P. Kingsley.
1978. The forest-land owners of West Virginia. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-58. 76 p., illus.

A statistical-analytical report on the owners of privately owned commercial forest land in West Virginia. The study was conducted in conjunction with the third forest survey of West Virginia by the Forest Service, U.S. Department of Agriculture. Statistical findings are based on responses of owners to a mailed questionnaire. Also included are trends in forest-land ownership and the attitudes and intentions of owners toward owning forest land, timber management, timber harvesting, and recreational use.

36. Bishop, Dwight E., and Myles A. Simpson.
1977. Outside and inside noise exposure in urban and suburban areas. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 183-194.

In urban and suburban areas of the United States (away from major airports), the outdoor noise environment usually depends strongly on local vehicular traffic. By relating traffic flow to population density, a model of outdoor noise exposure has been developed for estimating the cumulative 24-hour noise exposure based upon the population density of the area. This noise model has been used to provide first-order estimates of noise exposure in urban areas of this country. The model also can be used to estimate the variation in noise levels in communities and to plan community noise surveys. Field measurements at 100 locations throughout the country have shown good agreement with this model.

37. Bjorkbom, John C., and Rodney G. Larson.
1977. The Tionesta Scenic and Research Natural Areas. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-31. 24 p., illus.

A brief history and description of the Tionesta Scenic and Research Natural Areas in northwestern Pennsylvania. These areas are a remnant of the hemlock-beech climax forest that once covered 6 million acres of the Allegheny Plateau in Pennsylvania and New York. Changes that have occurred in this forest are described, and the trees, shrubs, herbs, and vertebrates present in the climax forest are listed.

38. Blackburn, Thomas.
1977. Washington's "free" 300-Station microscale weather network. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 98-108.

This article is intended to encourage those planning to conduct meso- or microscale weather studies to supplement their sophisticated observing techniques and equipment with low-cost observations taken by volunteers. Such observations can often show high benefits per unit cost by expanding the geographical area of study, increasing the density of observations, or verifying the validity of urban study findings. Techniques used in recruiting and sustaining the 300-station volunteer network in Washington, D.C., are described.

39. Blanchard, R. O., and W. C. Shortle.
1977. Changes in electrical resistance associated with disease and death of elm seedlings. Proc. Am. Phytopathol. Soc. 4: 183.

40. Blanchard, Robert O., Desmond Smith, Alex L. Shigo, and L. O. Safford.
1978. Effects of soil-applied potassium on cation distribution around wounds in red maple. Can. J. For. Res. 8: 228-231, illus.

Cation levels around wounds were evaluated to determine rate of concentration and relation of net increase to availability following soil amendments. Forty trees in four clones of 6-year-old red maple were paired by stem size. Half the clones were amended with soil-applied potassium chloride at 450 kg potassium/hectare. One tree of each pair was wounded and one pair of trees from each clone was harvested each week for 5 weeks. Concentrations of K, Mg, and Mn around wound sites and comparable sites on nonwounded trees were determined for each harvest. Concentrations of the elements in wounded tissues increased significantly over the 5-week period. Addition of K to the soil did not appear to influence concentrations of Mg or Mn in wounded or nonwounded tissues.

41. Blum, Barton M.
1977. Animal damage to young spruce and fir in Maine. U.S. Dep. Agric. For. Serv. Res. Note NE-231. 4 p., illus.

The loss of terminal buds on small balsam fir (Abies balsamea (L.) Mill.) and spruce (Picea spp.) trees because of nipping by mammals or birds has increased on the Penobscot Experimental Forest in recent years. The cut stem is smooth and slightly angled; there is no sign of tearing. Unnipped trees grew about 13 percent more than the nipped trees; the nipped trees showed less vigor in the lateral bud that took over as leader.

42. Blyth, James E., and James T. Bones.
1977. Veneer log production in the Northeast and North-central States in 1976. North. Logger 26(5): 10.

From a survey of veneer producers in the Northeast and North-central States in 1976, veneer-log production and receipts by states and regions are presented. Comparisons are made with a similar survey made in 1972 in the 21-state area. The article contains the number of veneer plants operating in 1976.

43. Blyth, James E., and James T. Bones.
1978. Pulpwood production in the Northeast and North Central states in 1977. North. Logger 27 (6): 18.

Pulpwood production increased 6 percent between 1976 and 1977 in the 21-state area. These statistics and others resulted from a complete canvass of eastern wood pulp mills conducted annually by the Forest Service Experiment Stations. The article contains 1977 pulpwood production statistics by states and sources of pulpwood and the number of mills that were operating.

44. Bond, Robert S. and Charles H. Wolf.
1978. Status and outlook of bonded Canadian woodworkers in Maine. North. Logger 26(11): 6-7, 44.

Employment of bonded Canadians in timber harvesting in Northern Maine has declined to fewer than 1000 persons or about one-fifth as many as in the 1950's. Replacement of these nonimmigrants by unemployed domestic workers is hindered by the lack of experience on the part of domestic workers and a reluctance to live in logging camps. Changes in harvesting technology, immigration laws, and the organization of the labor force should continue to reduce employer dependence on bonded workers.

45. Bones, James T.
1977. Residues for energy in New England. North. Logger 25(12): 20-22, 34, illus.

Future shortages of oil and natural gas, rising fuel costs, and stricter pollution regulations will make burning wood residue increasingly attractive. Most observers agree that the wood products industry has a unique potential to generate its own fuel, avoiding some costs. Progress toward energy self-sufficiency, however, will come step by step and will require major research and capital investment.

46. Bones James T.
1978. The forest resources of West Virginia. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-56. 105 p., illus.

A statistical and analytical report of the third forest survey of West Virginia by the Forest Service, U.S. Department of Agriculture. Findings are based on the remeasurement of 1/5-acre plots and new 10-point cluster plots. This report analyzes trends in forest land area, timber volume, annual growth, and timber removals. Timber products output by forest industries, based upon a canvass of industries in 1974, and the importance of timber and forests to the State's economy and environment are also discussed. The report includes a discussion of the outlook for timber supplies during the next 30 years, a discussion of resource management opportunities, and 65 tables of statistical data.

47. Bones, James T., and James E. Blyth.
1977. Pulpwood production in the Northeast and North Central States in 1976. North. Logger 26(3): 22.

Between 1975 and 1976, pulpwood production increased 14 percent in the 21-state area. These statistics and others resulted from a complete canvass of eastern woodpulp mills conducted annually by the Forest Service experiment stations. The article contains 1976 pulpwood production statistics by states and sources of pulpwood and the number of mills that were operating.

48. Bones, James T., and John E. Brodie.
1977. The timber industries of Maryland. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-52. 20 p., illus.

The result of a complete survey of the timber industries of Maryland, this report contains statistics about industrial timber production and receipts, and production and disposition of the manufacturing residues. Comparisons are made with the most recent previous survey, and trends in industrial wood output are noted.

49. Bones, James T., and David R. Dickson.
1977. Pulpwood--1976. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-53. 23 p., illus.

An annual assessment of regional timber output based upon canvasses of the pulpmills in the Northeast. Contains data about pulpwood production from roundwood in the 14 northeastern states by counties and species groups, pulpwood chip production from plant residues, and production of total-tree chips. Pulpwood production between 1975 and 1976 increased 14 percent; roundwood production was up 12 percent and chipped residue production was up 21 percent. Trends in pulpwood production for the past 14 years are shown along with a list of the woodpulp mills that received northeastern pulpwood during 1976.

50. Bones, James T. and David R. Dickson.
1978. Veneer, 1976--A periodic assessment of regional timber output. U.S. Dep. Agric, For. Serv. Resour. Bull. NE-55. 13 p., illus.

A periodic assessment of regional timber output based upon a canvass of the veneer plants in the Northeast. Contains data about veneer-log production and receipts by states and species, log shipments between states and regions, and the disposition of the residues generated in the manufacture of veneer. Veneer log production between 1972 and 1976 increased 4 percent and northeastern veneer plant receipts decreased 2 percent. Trends in production and an outlook for the industry are presented along with a list of veneer plants in the Northeast.

51. Bones, James T., and Ralph P. Glover, Jr.
1977. The timber industries of West Virginia. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-47. 16 p., illus.

The results of a complete survey of the timber industries of West Virginia. The report contains statistics about industrial roundwood production and receipts, and production and disposition of the manufacturing residues that result. Comparisons are made with the previous survey, and trends in industrial wood output are noted.

52. Bones, James T., and Chauncey J. Lohr.
1977. The timber resources of Kentucky. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-50. 26 p., illus.

The results of a complete survey of the timber industries of Kentucky. The report contains statistics about industrial timber production and receipts, and production and disposition of the manufacturing residues that result. Comparisons are made with the most recent previous survey, and trends in industrial timber output are noted.

53. Bornstein, Robert D., and Yam-Tong Tam.
1977. Anthropogenic moisture production and its effect on boundary-layer circulations over New York City. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 36-52.

A heat and moisture excess over New York City is shown by helicopter soundings of temperature and set-bulb depression. The temporal and spatial distribution of anthropogenic moisture emissions in New York City were estimated from fuel-usage data. The URBMET urban boundary-layer model was used to evaluate the effects on the dynamics of the urban boundary layer resulting from the observed urban moisture excess. Work is currently in progress to determine the fraction of the observed moisture excess over New York that is anthropogenic.

54. Borthwick, J. O., G. Reethof, O. H. McDaniel, and D. E. Carlson.
1977. Attenuation of highway noise by narrow forest belts. (Abstr.) J. Acoust. Soc. Am. 62 Suppl. 1:S42-S43.

55. Braham, Roscoe R., Jr.
1977. Overview of urban climate. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 3-17.

The broad features of urban climate anomalies are described and explained by combining recent METROMEX data with those from prior studies. The urban heat island is well understood, and urban effects upon cloud nuclei and cloud microstructure are clearly observed and explained in part; but the causes of urban effects upon rainfall remain speculative.

56. Bringi, Sreedevi Krishnamurthy.
1978. Methodology of forest-tree selection for air pollution studies. MS Thesis, Ohio State Univ., Columbus. 85 p.

57. Brodie, John E., and Jean Nolley.
1978. Maryland's primary wood industry: a utilization summary and directory. MD. For. Serv., in cooperation with U.S. Dep. Agric. For. Serv. Northeast. For. Exp. Stn. 47 p.

58. Brown, S. E. and H. M. Mazzone.
1977. Electrophoretic studies in the development of the gypsy moth with special reference to isoenzymes. J. N.Y. Entomol. Soc. 85: 26-35.

59. Campana, R. J., and G. Gregory.
1976. Dutch elm disease control by pressure-injected solubilized MBC-HCL and excision of infected branch systems. (Abstr.) Proc. Am. Phytopathol. Soc. 3: 324.

60. Campbell, Robert W.
1978. Some effects of gypsy moth density on rate of development, pupation time, and fecundity. Ann. Entomol. Soc. Am. 71: 442-448.

61. Campbell, Robert W., and Ronald J. Sloan.
1977. Forest stand responses to defoliation by the gypsy moth. For. Sci. Monogr. 19. 34 p.

Records accumulated between 1911 and 1931 from plots in eastern New England were analyzed to determine forest changes following defoliation by the gypsy moth. Oak

trees required about 10 years to recover fully from a single heavy defoliation. Dominant trees were degraded less than subdominants and were less likely to die. Trees in poor condition were more likely to die after defoliation than oak trees. Red maple was more likely to die after defoliation than white pine. Repeated defoliation resulted in more and more one-storied stands. Differential loss rates among favored and non-favored food species tended to alter forest composition toward less susceptible types. Certain trees within any given tree species were consistently defoliated more heavily than others. These trees were also more likely to die.

62. Campbell, Robert W., and Ronald J. Sloan.
1977. Natural regulation of innocuous gypsy moth populations. Environ. Entomol. 6: 315-322.

Results of preliminary studies on numerical stability among a series of sparse gypsy moth populations studied between 1975 and 1970 supported the hypothesis that year-to-year numerical stability among these populations was determined largely by a combination of predaceous birds, which tended to concentrate on instar IV-VI larvae, and small mammals, especially Peromyscus leucopus, which tended to concentrate on pupae. The results also indicated that vertebrate predators were consuming about half of the parasitized instar IV-VI larvae, and most of the parasitized pupae.

63. Campbell, Robert W., and Ronald J. Sloan.
1977. Release of gypsy moth populations from innocuous levels. Environ. Entomol. 6: 322-330, illus.

Populations of the gypsy moth, Lymantria dispar (L.), tend to increase numerically from innocuous levels where there are abundant sheltered resting and pupation locations that reduce the probability that the growing insects will be eaten by vertebrates. These sheltered locations may be found anywhere within the environment, and they may occur naturally or be introduced by man; they are usually above the forest floor, close to or part of a suitable host tree, and dark, dry, and rough.

64. Campbell, Robert W., and Ronald J. Sloan.
1978. Numerical bimodality among North American gypsy moth populations. Environ. Entomol. 7:641-646, illus.

North American gypsy moth populations can be contained indefinitely within a sparse density range. Conversely, outbreaks can persist for up to a decade. Both the transition from sparse to outbreak and from outbreak to sparse tend to be abrupt. The study and management of these populations should be based largely on the realization that the overall system can behave in a numerically bimodal way.

65. Campbell, Robert W., and Ronald J. Sloan.
1978. Natural maintenance and decline of gypsy moth outbreaks. Environ. Entomol. 7:389-395.

In North America, area-wide outbreaks by the gypsy moth, Lymantria dispar (L.), have persisted for as much as a decade. The analysis of records accumulated on this insect throughout the northeastern United States indicates that such outbreaks are most likely to persist from one year to the next when insect densities range widely among the subpopulations in the overall population system. Area-wide outbreaks are likely to decline during years when numerical variability is minimal among the subpopulations. To be accurate, future projections of the natural maintenance and decline of area-wide outbreaks must account for the intrapopulation phenomena that give rise to these results.

66. Campbell, Robert W., Ronald J. Sloan, and Cynthia E. Biazak.
1977. Sources of mortality among late instar gypsy moth larvae in sparse populations. Environ. Entomol. 6:865-871.

Survival of instar IV-VI gypsy moths, Lymantria dispar (L.), in a sparse and numerically stable population near Eastford, Conn., was inversely correlated with larval density. Larvae that rested in bark flaps during the day were more likely to survive than those

that rested in the forest litter. Since few of these insects were killed by parasites or disease, we believe that most of them were eaten by density-dependent predators that can forage in the litter; our results suggest that predaceous birds were important in determining the survival rate of larvae in this sparse, stable population. The results also suggest that predator densities in this particular area were always sufficient to remove most of these larvae.

67. Cannon, William N., Jr., Jack H. Barger and David P. Worley.
1977. Dutch elm disease control: intensive sanitation and survey economics. U.S. Dep. Agric. For. Serv. Res. Pap. NE-387. 10 p., illus.

Recent research has shown that prompt removal of diseased elms reduces the incidence of Dutch elm disease more than the sanitation practice that allows diseased elms to remain standing into the dormant season. The key to prompt removal is repeated surveys to detect diseased elms as early as possible. Intensive sanitation can save more elms and cost less than the more conventional sanitation practice. A 3-year case history demonstrates savings of 25 percent in total cost and an additional 92 elms per thousand.

68. Cannon, W. N., Jr., J. H. Barger, and D. P. Worley.
1977. Intensive sanitation program shows cost savings of 25% in Dutch elm disease control. Park Maint. 39(12): 10-13. (Reprint of U.S. Dep. Agric. For. Serv. Res. Pap. NE-387).

69. Carl, Clayton M., Jr., and Harry W. Yawney.
1977. Fall versus spring sowing of sugar maple seed in a nursery. Tree Planters' Notes 28 (3 and 4): 24-26, 31, illus.

We compared germination and seedling development between sugar maple seeds sown in the fall and seeds that were stratified for 38, 49, and 60 days and sown in the spring. After one growing season, seedlings from fall-sown seeds were superior in survival and

height growth to those from spring-sown seeds. Because some sugar maple seeds apparently require a longer stratification period than others, none of the three spring treatments tested satisfied the germination requirements for all seeds; however, all of the seeds that were sown in the fall germinated.

70. Carlson, D., O. H. McDaniel, and G. Reethof.
1977. Layered media model for ground absorption. Inter-Noise 77. Vol. 2.

71. Carlson, D. E., O. H. McDaniel, and G. Reethof.
1977. Layered media model for ground absorption. (Abstr.) J. Acoust. Soc. Am. 62 Suppl. 1:S42.

72. Caswell, Stephanie J., and Karl Jakus.
1977. Role of land use planning in noise control. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 242-253.

A method for controlling outdoor noise through land use planning utilizes a computer model that broadly assesses the likely noise environments of a community on the basis of generalized land use and highway noise production and transmission conditions. The method is designed to enable town planners and other community decision-makers to identify those general areas that are potentially unsuitable for noise-sensitive types of development such as housing. The method also predicts probable changes in noise environments and in the suitability of those environments due to general changes in land use (development). The method does not require site-specific measurements.

73. Church, Thomas W., Jr.
1977. Industrial fuel - a solution to your tie-disposal problem. Crossties 58(3): 26-28.

Disposal of old crossties has become a major problem for railroads. By converting them into industrial fuel, the 2 million tons of old ties removed from track each year could be burned without polluting the environment.

Nationally, this tie fuel would conserve the equivalent of 4-1/2 million barrels of oil per year. At present, the cost of recycling old ties for fuel would exceed the railroads' return from marketing the fuel. However, selling tie fuel would reduce current disposal costs by at least 40 cents per tie.

74. Cicerello, Ronald R.
1978. Age and growth of largemouth bass, Micropterus salmoides (Lacepede), and bluegill, Lepomis Macrochirus robineque, in two unfertilized strip mine ponds in Breathitt County, Ky. 133 p. August 1978. M.S. thesis, Eastern Kentucky Univ.

75. Clark, F. Bryan.
1977. The central hardwood forest. In Central Hardwood Forest Conf. Proc. p. 1-9. South. Ill. Univ., Carbondale.

Defines the central hardwood forest, its boundaries and general plant associations. Past and present conditions are discussed along with factors likely to influence the future of this vast resource.

76. Clark, F. Bryan.
1978. Science and the Society of American Foresters. J. For. 76: 617.

Describes the present science programs of the Society of American Foresters and recommends changes.

77. Clark, F. Bryan.
1978. Biological potential of hardwoods: How to capture it. In Resource availability and the hardwood forest products industry. Proc. 1977 John S. Wright For. Conf., Purdue Univ. p. 27-39.

Most hardwood forest sites have retained their capacity for production despite past treatment, including heavy cutting. However, the growth potential varies widely with species composition and site quality. There are good opportunities to improve the growth of selected

high-quality trees. Technology is available to recapture the biological potential of neglected hardwood forests but the private owner needs advice and assistance.

78. Coleman, Derek J.
1977. Ecology of an urban park. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 351-354.

A controversial issue in the city of Kitchener, Ontario, involves the proposed extension of a boulevard through Lakeside Park. A study of this proposal revealed several facets of human interrelations with an urban park. Most important, there was a large gap between the perception and the reality of its environmental quality. This has several practical implications in planning parks in the city.

79. Coleman, Ronald E.
1977. SEMTAP (Serpentine End Match TApe Program). U.S. Dep. Agric. For. Serv. Res. Pap. NE-384. 5 p., illus.

SEMTAP (Serpentine End Match TApe Program) is an easy and inexpensive method of programming a numerically controlled router for the manufacture of SEM (Serpentine End Matching) joints. The SEMTAP computer program allows the user to issue commands that will accurately direct a numerically controlled router along any SEM path. The user need not be a computer programmer to produce a variety of SEM patterns.

80. Cook, David I., and David F. Van Haverbeke.
1977. Suburban noise control with plant materials and solid barriers. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 234-241.

Studies were conducted in suburban settings with specially designed noise screens consisting of combinations of plant materials and solid barriers. The reduction in sound level is reported, and tentative recommendations are made for the use of plant materials and solid barriers in noise screens.

81. Corbett, E. S.
1977. Land Use. In W.E. Sopper, J.A. Lynch, and E.S. Corbett, eds. Water resources at the forest-urban interface. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Res. PA-2. p. 14-17.

The North Atlantic region contains only 5% of the nation's land area, but 25% of the national population. The extreme concentration of urban development is indicated by the fact that almost 87% of the land area is occupied by cropland, pasture, or forest, while 82% of the region's population lives on the remaining 13%. The effects of land use changes on the hydrology of an area and on sedimentation in urban environments is discussed and research needs outlined.

82. Corbett, E. S.
1977. Publication education and acceptance. In W.E. Sopper, J.A. Lynch, and E.S. Corbett, eds. Water resources at the forest-urban interface. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Res. PA-2. p. 46-47.

Health, social, political, and economic considerations, in addition to physical and technical aspects, are important in gaining a complete perspective for the utilization of wastewater. The public can play a key role in blocking approaches considered acceptable by those designing systems of wastewater disposal. For an idea such as recycling urban sewage and sludge on the land to be put into effect in our society, it must have public acceptance. The diffusion and adoption of new ideas is discussed. Resistance to change by individuals and institutions and principles to consider in developing educational programs for wastewater utilization are outlined along with research needs.

83. Corbett, E. S.
1977. Recreation. In W.E. Sopper, J.A. Lynch, and E.S. Corbett, eds. Water resources at the forest-urban interface. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Res. PA-2. p. 17-22.

Municipal watersheds in megalopolis have been providing quality water for domestic use (as well as timber products and municipal income) for many years. However, they are also a recreational and aesthetic resource. Benefits derived from these resources are human experiences which are produced and enjoyed on the site. The impacts of recreation-associated use on water quality are discussed and case histories are used as examples. Policy implications and research needs are outlined.

84. Corbett, Edward S., James A. Lynch, and William E. Sopper.
1978. Timber harvesting practices and water quality in the eastern United States. J. For. 76: 484-488, illus.

Data from forested experimental watersheds in the eastern United States indicate that leaching of nutrients after timber harvesting, especially clearcutting, tends to increase from south to north, while increases in streamwater temperature and sediment loadings tend to decrease. Concentrations of nutrients in streamwater are highest where revegetation of cutover areas is delayed. Also, increased streamwater temperature (in addition to increased light) caused by exposing stream channels may influence water quality by affecting a wide range of physical, chemical, and biological processes. Soil erosion losses from harvesting operations can be kept to acceptable levels by following available land management guidelines, and with supervision by qualified foresters. Buffer strips, in which only light selection cutting is allowed, will help minimize sedimentation as well as nutrient leaching and stream temperature increases.

85. Cowling, Ellis, B., and Leon S. Dochinger.
1978. The changing chemistry of precipitation and its effects on vegetation and materials. Am. Inst. Chem. Eng. Symp. Ser. 74: 134-142.

86. Crawford, H. S.
1976. Integrating deer habitat evaluation into forest land use planning. Proc. 10th Northeast Deer Study Group, Yarmouth, Nova Scotia, Canada, September 1974. p. 6-14.

87. Crawford, H. S. and W. L. Stutzman.
1977. Measuring deer habitat attributes with microwave signal attenuation. In Trans. 11th Meet. Northern Deer Study Group, Quebec City, P.Q., Sept. 1975. p. 123-132.

88. Cuppett, Donald G.
1977. Use of solar energy in drying lumber. In Practical application of solar energy to wood processing. (Va. Polytech. Inst. and State Univ. Workshop Proc.) For. Prod. Res. Soc., Madison, Wis. p. 62-64.

Summarizes world-wide research and development of solar dry kilns and suggests how U.S. firms can apply existing knowledge to small-scale drying operations. Also proposes new research required to enable wider use of solar energy to heat large scale commercial kilns and low-temperature dryers. Author's research in solar-assisted low-temperature drying found immediate potential for construction of new units to utilize substantial amounts of solar heat in the drying process.

89. Cuppett, Donald G., and David M. Emanuel.
1978. Yield of utility boards from No. 2B Common yellow-poplar lumber. In Marketing and utilization of yellow-poplar: Symp. Proc. Knoxville TN March 21-22, 1978. Inst. Agric. Univ. Tenn. p. 151-157.

90. Curtis, Willie R.
1977. Hydrologic aspects of surface mining in the East. Proc. Soc. Am. For. 1977: 152-157.

Surface mining drastically disturbs the land; it may change the hydrology of watersheds and adversely affect water quality. Proper reclamation and prompt revegetation can minimize these effects, and some of the changes may even be advantageous because detention and retention storage capacities may be increased.

91. Curtis, Willie R.
1977. Sampling for water quality. In William H. Kirchhoff (ed.), Methods and standards for environmental measurement. Proc. 8th Materials Res. Symp. Gaithersburg, MD. 1976. U.S. Dep. Commer., Natl. Bur. Stand. p. 237-244.

Samples collected weekly from six first-order streams in eastern Kentucky over seven water years were used to determine what frequency of sampling would provide the best estimate of water quality from the fewest samples. Results indicate that baseline water quality can be adequately defined by sampling every 2 weeks for 1 year. Biweekly sampling was also adequate during and immediately after surface mining. Monthly sampling was found to be generally adequate a year or more after mining was completed. Regression analyses indicated that specific conductance can be used to estimate the concentrations of dissolved solids and of dissociated ions such as calcium, magnesium, and sulfate.

92. Curtis, Willie R.
1977. Surface mining and the flood of April 1977. U.S. Dep. Agric. For. Serv. Res. Note NE-248. 4 p., illus.

Data from experimental sites in Breathitt County, Kentucky, and Raleigh County, West Virginia, showed that during a major rainstorm on 4 April 1977 streamflow from surface-mined watersheds peaked lower than that from adjacent or nearby unmined watersheds.

93. Curtis, Willie R.
1978. Hydrologic aspects of surface mining in the East. In Proc. Soc. Am. For. 1977 Natl. Conv., Oct. 2-6, Albuquerque, N.M. p. 152-157.

94. Curtis, Willie R., and Michael J. Superfesky.
1977. Erosion of surface-mine spoils. Proc. 32nd Annu. Meet. Soil Conserv. Soc. Am. p. 154-158.

New mining and reclamation techniques such as returning spoil to approximate original contour and head-of-hollow construction have not been evaluated to determine

their potential for causing erosion and sedimentation. A study was made of the effects of time, precipitation, and position on the slope on erosion on a reclaimed back-to-contour slope in Caryville, Tenn., and on the outslope of a head-of-hollow fill in Breathitt County, Ky. Erosion at Caryville totaled 1.30 inches (33.02 mm) from 23 August 1974 through 27 April 1976, or 235 tons/acre (526.8 t/ha). Erosion at the Breathitt County site totaled 0.94 inch (23.8 mm) from 16 May 1973 through 22 July 1975, or 170 tons/acre (381 t/ha). Results also indicated that long uninterrupted spoil slopes are conducive to the formation of rills and gullies. Although these soil losses were measured over 26 months in Kentucky and over 20 months in Tennessee, the amount of material that actually left the disturbed area was not determined.

95. Cuscino, Thomas A., Robert Jennings Heinsohn, and Clotworthy Birnie, Jr.
1977. Fugitive dust from vehicles travelling on unpaved roads. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 295-302.

A model has been developed for estimating concentrations of fugitive dust downwind of an unpaved road within a factor of 2 for most cases. The model allows for winds oblique to the road and also for extraction of fugitive dust from the plume as it diffuses to the ground. Experiments were performed to determine the accuracy of the model in estimating downwind concentrations of fugitive dust generated by a vehicle travelling on a gravel road.

96. Cushwa, Charles T., and Joseph E. Barnard, and Robert B. Barnes.
1978. Trends in woodcock habitat in the United States. In Proc. 6th Woodcock Symp. Fredericton, New Brunswick. p. 31-38.

Timber data from national reports for 1963 and 1970 were summarized and their implications for woodcock (Philophela minor) habitat in 30 states interpreted.

This analysis indicated a net gain in potential woodcock breeding habitat in 19 states of 2,715,095 ha and a net gain of 3,658,438 ha of potential winter habitat in 11 states. Published area data on potential woodcock habitat are highly variable, indicating that we do not have accurate or complete summaries of available data. Several activities to improve the data base on woodcock habitat are recommended.

97. Cuthbert, R.A., J.W. Peacock, and W.N. Cannon, Jr. 1977. An estimate of the effectiveness of pheromone-baited traps for the suppression of Scolytus multistriatus (Coleoptera: Scolytidae). J. Chem. Ecol. 3: 527-537, illus.

We attempted to suppress a population of Scolytus multistriatus (Marsham), the principal vector of Dutch elm disease, by trapping flying beetles on sticky traps baited with synthetic pheromone. The estimated catch on 421 traps distributed throughout a 1-km^2 plot in Detroit, Michigan, was nearly 1 million beetles. Because as estimated 5 million beetles emerged in the plot during the study period, we conclude that this preliminary trapping study had no appreciable effect on suppressing the population. Studies that employ improved materials and techniques are continuing.

98. Cuthbert, Roy A., and John W. Peacock. 1978. Response of the elm bark beetle, Scolytus multistriatus (Coleoptera: Scolytidae), to component mixtures and doses of the pheromone multilure. J. Chem. Ecol. 4: 363-373, illus.

The response of the elm bark beetle, Scolytus multistriatus (Marsham), to various doses and mixtures of the three components of its aggregation pheromone was measured. The ratio of the components released, particularly heptanol to multistriatin, strongly influenced the number, but not the sex ratio, of beetles that responsed. We concluded that a bait that released about 400: 100: 800 yg/day of heptanol-multistriatin-cubebene would be effective in mass-trapping beetles

99. Czapowskyj, Miroslaw M.
1977. Status of fertilization and nutrition research in northern forest types. In Proc. Symp. Intensive Culture of Northern Forest Types. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-29. p. 185-203.

Forest fertilization is a useful tool that, when combined with other silvicultural practices, results in increased forest growth. Many experiments have demonstrated that both hardwoods and conifers of the northern forest respond to the addition of one or more nutrients. Examples of pitfalls and successes are given. Present status of research and future research needs are discussed.

100. Czapowskyj, Miroslaw M.
1977. Hybrid poplar on two anthracite coal mine spoils: 10-year results. U.S. Dep. Agric. For. Serv. Res. Note NE-268. 4 p.

101. Czapowskyj, Miroslaw M., Robert V. Rourke, and Robert M. Frank.
1977. Strip clearcutting did not degrade the site in a spruce-fir forest in central Maine. U.S. Dep. Agric. For. Serv. Res. Pap. NE-367. 8 p.

Changes in nutrient concentration in the forest floor and in the mineral soil were assessed on a mature spruce-fir stand in central Maine that had been harvested in 1965 by strip clearcutting. On part of the site, slash was left in place; on other parts it was removed, and on some it was burned. Eight years after the harvest, the clearcut areas tended to have increased pH and increased concentrations of bases and percentages of base saturation, but the amounts of N and P were comparable to those in the residual forest. Soil drainage class and differences in parent material were the major sources of variation. There were no significant differences between controls and slash-disposal treatments or among treatments. There was no evidence of site degradation from strip clearcutting.

102. Daft, M. J., and E. Hacskaylo.
1977. Growth of endomycorrhizal and nonmycorrhizal red maple seedlings in sand and anthracite spoil. For. Sci. 23: 207-216.

The growth of red maple was increased when the plants, grown in either sand or anthracite waste containing bonemeal, were infected with Glomus macrocarpus var. geosporus or Gigaspora gigantea, respectively. The importance of phosphate and nitrate for normal development was shown in plants grown in sand culture. Mycorrhizal plants grown in sand or anthracite contained more phosphorus than nonmycorrhizal plants. Effects of the various nutrient treatments and mycorrhizal infection on the size of the plants, leaf numbers, leaf areas, stem anatomy, and chemical composition of the plant tissues are reported. Both the secondary and beaded tertiary roots became infected with the fungal endophytes. The possibility of exploiting this symbiosis on anthracite spoil areas is discussed.

103. Davidson, Walter H.
1977. Performance of ponderosa pine on bituminous mine spoils in Pennsylvania. U.S. Dep. Agric. For. Serv. Res. Pap. NE-358. 6 p., illus.

Seedlings from 40 seed sources of ponderosa pine (Pinus ponderosa Laws.) were planted on a strip-mine spoil in central Pennsylvania in 1969. Survival of seedlings from different sources ranged from 23 to 90 percent after six growing seasons. The average height of the seedlings ranged from 67 to 140 cm for the same period. Eight sources produced seedlings that were average or above in both height growth and survival.

104. Davidson, Walter H.
1977. Birch species survive well on problem coal mine spoils. Northeast For. Tree Improve. Conf. Proc. 24: 95-101.

Seven species of birches from 10 seed sources were evaluated for survival and growth rates on coal mine

spoils in Pennsylvania. The seedlings were planted on eight very acidic strip-mine spoil areas, pH 3.0 to 3.8, and one acidic strip-mine area, pH 3.3. After 3 years, survival was rated satisfactory to good on all the spoil areas. Birches from three sources did not survive satisfactorily on the deep-mine refuse. Height evaluations were biased by damage caused by browsing deer. Nevertheless, a few seedlings attained heights of 200 cm or more. Paper birch from a northeastern seed source is recommended for reclamation plantings in Pennsylvania.

105. Davidson, Walter H.
1978. Genetic variation of ponderosa pine provenances on Pennsylvania coal-mine spoils. (Abstr.) 4th North Am. For. Biol. Workshop Proc. Syracuse, N.Y. p. 194.

106. Davidson, Walter H., and Jane Riddle.
1978. Old strip mine produces . . . new pulpwood crop. Pa. For. 68(2): 18.

107. DeBald, Paul, Dick Kennell, Dick Watt, and Dave Worley.
1976. Silviculture + economics = good timber marking. In Proc. 1st State For. Manage. Conf. Perrysville, Ohio. U.S. Dep. Agric. For. Serv. Northeast. Area State and Priv. For., Upper Darby, Pa. p. 91-102.

Describes a timber-marking procedure for intermediate cuts that combines silvicultural considerations with economic guidelines. Explains how the procedure works and, with examples, shows why it works. Emphasizes the procedure's usefulness in marking timber for multiple-use objectives and in measuring in investment terms the timber growing opportunities given up to achieve other goals.

108. DeBlois, R. W., E. E. Uzgiris, D. H. Cluxton and H. M. Mazzone.
1977. Comparative measurements of size and polydispersity of several insect viruses. General Electric Corp. Tech. Rep. #77CRD250, December 1977.

109. DeGraaf, R. M.
1977. Common residents--the suburban birds. In Birds and their habitats in Amherst, Massachusetts. P. Westover (ed.). Hitchcock Center for the Environment. p. 14-22.

This chapter in a locally-published booklet presents the basic natural history of some common year-round and summer birds of southern New England. Basic behavior, nest sites and foods are presented for 22 species, along with some hits for attracting them.

110. DeGraaf, R. M.
1977. Bringing in the birds. Mass. Wildl. 28(5):14-17.

111. DeGraaf, R. M.
1978. The importance of birds in ecosystems. In R.M. DeGraaf, Tech. Coord., Proc. Workshop on Nongame Bird Habitat Management in the Coniferous Forests of the Western United States. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. PNW-64.

112. DeGraaf, R. M.
1978. New life from dead trees. Natl. Wildl. 16(4): 28-31.

113. DeGraaf, R. M. (Technical Coordinator)
1978. Management of southern forests for nongame birds. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. SE-14. 176 p.

114. DeGraaf, R. M. (Technical Coordinator)
1978. Proceedings nongame bird habitat management in the coniferous forests of the western United States. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. PNW-64. 100 p.

115. DeGraaf, R. M., H. R. Pywell, and J. W. Thomas.
1977. Relationships between nest height, vegetation, and housing density in New England suburbs. Trans. 32nd Fish and Wildl. Conf. p. 130-150.

This paper presents the patterns of distribution of nesting birds in a suburban town and the nest-site preferences of 13 bird species. A total of 1653 nests, representing 21 bird species, were found in five categories of housing density; results showed that total nesting density was significantly higher in low-density suburbs. More crowded suburbs and business districts had significantly lower nest densities than expected. Nest site preference indices were calculated for 13 bird species--all revealed pronounced nesting preferences among available tree and shrub species.

116. DeWalle, D. R., and R. E. Jackobs.
1977. Trees around properties cut home heating costs. Sci. in Agric. 24 (4):9.

117. Dickerson, A. Laverne
1977. The Youth Conservation Corps and adolescents' self-concept. In: Children, Nature, and the Urban Environment. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-30. p. 143-149.

118. DiMartino, David R.
1977. Relocation within the urban environment. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 382-388.

Analysis of motives indicates that minimal consideration is given to the physical environment when urban households select from among alternative residential locations. There is a greater awareness of, and response to, the economic and social conditions of the residential environment among movers. When the motivations of highly-educated white-collar professionals are correlated with their household characteristics and

residency experience few variables discriminate at all between those who view the physical environment as an important motive for relocation, and those who do not. The physical environment is cited more frequently (and considered more important) during the relocation process by owners of residences, rather than renters.

119. Dindal, D., and L. Levintan.
1977. The soil invertebrate community of composting toilet systems. Proc. VI Colloq. Soil Zool. Uppsala, Sweden.

120. Dixon, W. N., M. W. Houseweart, and Daniel T. Jennings.
1978. How to examine branches for spruce budworm egg masses. Coop. For. Res. Unit, School of For. Resour. Univ. Maine, Orono. 16 p.

121. Dixon, Wayne N., Mark W. Houseweart, and Daniel T. Jennings.
1978. How to examine branches for spruce budworm egg masses. CANUSA/CFRU. 18 p.

122. Dochinger, Leon S.
1977. Effects of soil applications of acidified solutions on growth and survival of forest tree species. (Abstr.) Proc. Am. Phytopathol. Soc. 3: 304.

123. Dochinger, Leon S., and Stanford L. Arner.
1978. Needle mottle in eastern white pine seedlings: A selective parameter for air pollution sensitivity. U.S. Dep. Agric. For. Serv. Res. Pap. NE-406. 5 p., illus.

Positive correlations were established between morphological characteristics in eastern white pine seedlings and subsequent tolerance or sensitivity to air pollution 5 and 7 years after outplanting in Ohio plantations. Of 11 seedling variables, needle mottling was an accurate indicator of sensitivity or tolerance to air pollution. This characteristic, which may be genetically controlled, should allow for the detection and removal of sensitive white pines in the nursery during grading.

124. Dochinger, Leon S., and Jack G. Calvert.
1978. Air pollution sources: General effe
and trends. In New directions in Century 3
tegies for land and water use. Soil Conser
Am. Proc. 33: 187-193.

Interest in air pollution has intensified throughout
world because of the continual increases in waste
emissions and their cumulative deposition on the earth
surfaces. These aerial wastes may be potentially ben
ficial in small quantities but harmful in larger amou
and soil, water, and vegetation are the primary biolo
cal sinks for them. Decisions that involve economic
and environmental tradeoffs for clean energy must be
made with consideration of the long-term consequences
of ambient pollution in the biosphere.

125. Dochinger, Leon S., and Ellis B. Cowling.
1978. Impact of acid precipitation on forest
freshwater ecosystems in Norway. J. Water, Air,
and Soil Pollut. 8: 389-390.

Report summarizes accomplishments of the interdisciplinary Norwegian research project "Acid precipitation - Effects on forest and fish." Research considerations should be provided for precipitation monitoring of the fluctuations of acidity in the forest environment and to developing realistic and ecologically safe plans for curtailing possible adverse effects of acidity on natural resources.

126. Dochinger, Leon S., and Eva J. Pell.
1976. Forest and air relationships: Research
priorities in the Northeast. Northeast. For.
Comm. RP-2.05-1. p. 1-18.

A task force has identified research priorities relate to northeastern forests and air pollution: (1) assessment of the impact of air pollution, (2) aicd precipitation and the forest ecosystem, (3) cleansing the air of pollutants by forest trees, and (4) genetic bases for tolerance of air pollution in forest tree species. This research needs a long-term coordinated interdisciplinary approach to provide the information needed for maintaining forest productivity and conserving the forest environment.

127. Donley, David E.
1978. Oviposition by the red oak borer, Enaphalodes rufulus Coleoptera: Cerambycidae. Ann. Entomol. Soc. Am. 71: 497-498, illus.

Oviposition and host preference tests were conducted with red oak borer, Enaphalodes rufulus (Haldemann), collected at the Scioto Trail State Forest, Ohio. Multiple matings were common but unmated females did not lay eggs. Forty-five females laid an average of 119 eggs, in a 19-day average oviposition period. Egg viability averaged 99 percent. Host preference tests indicated that the red oak borer prefers northern red oak, black oak, and scarlet oak over white oak for oviposition. When oak wood is not avialable, females lay only 4 percent of their eggs on species such as black walnut, white ash, shagbark hickory, red maple, and American elm. Oviposition sites are in bark cracks under bark scales, and under lichen patches.

128. Donley, David E., and J. Ronald Terry.
1977. How to identify damage by major oak borers in the eastern United States. U.S. Dep. Agric. For. Serv., Northeast. For. Exp. Stn. (Unnumbered publ.)

129. Donnelly, John R.
1977. Morphological and physiological factors affecting formation of adventitious roots on sugar maple stem cuttings. U.S. Dep. Agric. For. Serv. Res. Pap. NE-365. 5 p., illus.

Sugar maple cuttings were collected twice a week throughout June from four mature trees. Some of the cuttings were analyzed for carbohydrate (starch and sugars) and nitrogen content; the others were stuck in rooting beds. Rooting response showed significant daily and clonal variations. Cuttings rooted best when their terminal leaves were mature, as judged by size and color. Daily changes in rooting response were only weakly correlated with sugar and nitrogen concentrations, but rooting response peaked soon after a marked rise in starch.

130. Doskotch, R. T. M. O'Dell, and P. A. Godwin.
1977. Feeding responses of gypsy moth larvae, Lymantria dispar, to extracts of plant leaves. Environ. Entomol. 6: 563-566.

Feeding response of larvae of the gypsy moth (Lymantr dispar L.) to 30 plant leaf extracts is reported. Plant extract is incorporated into a basal diet of cellulose powder, agar, and water. The amount of feeding was measured by dry weight of frass produced in 24 h. Extracts were tested alone and in combinati with a stimulatory plant residue; this allowed classi· fication of extracts into four categories: stimulant neutral (no feeding effect); deterrent; and synergist

131. Duthie, A. H., K. M. Nilson, H. V. Atherton, and L. D. Garrett.
1977. Proposed score card for yogurt. Cultured Dairy Prod. J. Aug: 10-12. (Vt. Agric. Exp. Stn. J. No. 359).

A study designed to produce a new maple yogurt produc also produced a new score card for evaluating natural flavored yogurts. The scoring system evaluates color, body and texture, and flavor. The technique was used in developing a Swedish-style natural maple flavored yogurt.

132. Duthie, A. H., Suzanne Wulff, K. M. Nilson, H. V. Atherton and L. D. Garrett.
1977. Flavor panel selects all-natural maple yogurt. Cult. Dairy Prod. J., (Nov.): 8-10.

133. Dyer, Kenneth L., and Willie R. Curtis.
1977. Effect of strip mining on water quality ir small streams in eastern Kentucky, 1967-1975. U.S. Dep. Agric. For. Serv. Res. Pap. NE-372. 13 p., illus.

Eight years of streamflow data are analyzed to show the effects of strip mining for coal on chemical quality of water in six first-order streams in Breathitt Co., Ky. Data are presented on stream

discharge, turbidity, conductivity, pH, SO_4, Cl, HCO_3, Ca, Mg, Na, K, Fe, Al, Mn and Zn. Concentrations of most major dissolved constituents increased greatly during mining, reached a maximum a year or two after mining had ceased, then held steady for several years. Average stream pH values increased from about 6.8 before mining to about 7.4 after strip mining.

134. Echelberger, Herbert E., and George H. Moeller.
1977. Use and users of the Cranberry Backcountry in West Virginia: Insights for eastern backcountry management. U.S. Dep. Agric. For. Serv. Res. Pap. NE-363. 8 p., illus.

Users of the Cranberry Backcountry in West Virginia were sampled to learn their preferences and opinions about conditions, facilities, and management options, and to collect demographic data. Their responses were compared with those of western Wilderness Area visitors. The results may help managers make better informed decisions.

135. Economic Development Council of Northeastern Pennsylvania.
1977. Human needs served by outdoor recreation in northeastern Pennsylvania, 1977. Unnumbered Misc. Publ., 50 p.

136. Edwardh, Joey.
1977. Residential settings: effects of home and neighborhood on the quality of life for old people. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 389-398.

The author discusses the role of home and neighborhood in the lives of old people and explores the impact of the physical and social organization of these spaces on an old person's perception of his immediate environment and his subsequent activity patterns. Home and neighborhood reinforce an old person's sense of identity and mediate between the old person and the larger society. Information

about the meaning of home and neighborhood in the lives of old people contributes to the data available to those making the decisions that affect the distribution of social and physical resources in our cities.

137. Ellefson, Paul V., and Gilbert P. Dempsey.
1977. Promotion: a step toward sound Christmas tree marketing. Colo. For. Prod. Mark. Bull. 11(4): 4-5.

138. Emanuel, David M.
1978. Processing hardwood bark residues by screening. U.S. Dep. Agric. For. Serv. Res. Note NE-260. 3 p.

Most of the hardwood bark residues removed by floating-cutterhead or rosserhead debarkers can be processed into acceptable bark products by screening alone. And by prescreening bark residues, operators of bark processing plants can use smaller hammermills than otherwise are required, thus lowering investment and energy costs.

139. Fabos, Julius Gy.
1977. Composite landscape assessment: Assessment procedures for special resources, hazards and development suitability. Part II of the Metropolitan Landscape Planning Model (METLAND). Mass. Agric. Exp. Stn. Amherst, Bull. No. 637. 323 p.

140. Fabos, Julius Gy, and Kimball H. Ferris.
1977. A computerized model for integrating the physical environmental factors into metropolitan landscape planning. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 422-431.

This paper justifies and illustrates (in simplified form) a landscape planning approach to the environmental management of the metropolitan landscape. The

model utilizes a computerized assessment and mapping system, a recent advance in computer technology that allows for greater accuracy and the weighting of different values in mapping at the regional scale. It assesses resource, hazardous, and developmentally suitable areas to determine the consequences of development in these areas, and to channel development to the most environmentally appropriate areas.

141. Fahrer, Victor S., and Howard A. Peters.
1977. Use of a land-use-based emissions inventory in delineating clean-air zones. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. P. 263-272.

First the methodology used to establish a land-use-based emission inventory is described. Then this inventory is used as input in a simple model that delineates clean air and buffer zones. The model is applied to the town of Burlington, Massachusetts. Conclusions and recommendations are offered for the model's use and for interpretation of its results.

142. Fay. S. C. and R. E. Leonard.
1977. Handling backcountry privy wastes by bin composting. Appalachia (Dec.): 118-122.

143. Fay, S. C. and R. H. Walke.
1977. The composting option for human waste disposal in the backcountry. U.S. Dep. Agric. For. Serv. Res. Note NE-246. 3 p.

The disposal of human waste by composting at backcountry recreation areas is a possible alternative to methods that are considered unsafe. The literature indicates that aerobic, thermophilic composting is a reliable disposal method that can be low in cost and in maintenance. A bark-sewage mixture can be composted to produce a pathogen-free substance that might be used in site rehabilitation. Composting in a leakproof bin is odorless, and is largely independent of site conditions.

144. Federer, C. A.
1976. A SPAC model for transpiration and the availability of soil water. (Abstr.) Bull. Am. Meteorol. Soc. 57:1408.

145. Federer, C. A.
1977. Lead resistance and xylem potential differ among broadleaved species. For. Sci. 23: 411-419, illus.

Mean leaf diffusive resistance in unstressed trees and shrubs of 27 species in New Hampshire and southern Maine ranged only from 215 to 4.5 s/cm after normalizing to 15 mbar vapor pressure deficit. One species, Spiraea latifolia, had a higher resistance, 5.8 s/cm. During water stress, stomata partially closed at xylem pressure potentials that differed among genera, averaging -15 bar for Betula, -17 for Populus, -21 for Quercus, and -23 for Prunus. The potentials did not decrease further as resistances increased. Stressed Quercus and Prunus seedlings had lower potentials than did larger trees.

146. Federer, C. Anthony.
1978. Review of Water and Plant Life: Problems and Modern Approaches. For. Sci. 24: 140.

147. Felix, Robert, and Alex L. Shigo.
1977. Rots and rods. J. Arboric. 3(10): 187-190, illus.

Trees with internal rot, or crotches likely to split, can be helped by proper bracing. Although the holes made for the bracing materials are wounds, and wounds start the processes that can lead to rot, the braces can extend the time that trees with rot and weak crotches can remain safe, attractive, and healthy. An understanding of how rots develop and how rods should be installed will help the arborist to maximize the benefits of proper tree bracing and to minimize the injury caused by the new wounds required for the bracing materials. Some basic information on the development of tree rots and installation of bracing is given.

148. Filip, Stanley M.
1977. High-yield silviculture for northern hardwoods. In High-yield forestry in northern hardwoods, spruce-fir and white pine. 24th Annu. Meet. Soc. Prot. N.H. For. Nov. 21, 1975, Concord. p. 2-4.

High-yield or "intensive" silviculture should be used to maximize the yield of high quality sawtimber in northern hardwoods. This management includes pre-commercial and commercial cuttings in even-aged stands, and stand improvement cuttings in uneven-aged stands. To encourage high proportions of yellow birch and paper birch, and some sugar maple and white ash, regeneration cuttings such as strips, shelterwood, or block clear-cutting with site preparation are needed.

149. Filip, Stanley M.
1977. How applicable is uneven-age management in northern forest types? In Proc. Symp. Intensive Culture of Northern Forest Types. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-29: 53-62.

For the proper application and practice of uneven-age management, one must consider residual stocking, maximum tree-size objective, and diameter distribution. All three components are described, and it is shown how they fit into a practical package for application in a timber tract.

150. Filip, Stanley M.
1978. Impact of beech bark disease on uneven-age management of a northern hardwood forest. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-45. 7 p., illus.

Beech bark disease disrupted stand development during 24 years of management under the single-tree selection system, leading to a deficiency of large sawtimber trees and lowered butt-log quality. Group selection in combination with single-tree selection is recommended for improving species composition and maintaining stand stocking and structure.

151. Fisher, Edward L.
1978. Measurement and abatement of noise in the timber harvesting industry. MSIE Thesis, West Virginia Univ., Morgantown.

152. Fisher, E. L., and H. G. Gibson.
1977. Helicopter moves east - trial results. Agric. Eng. 58(8): 17-18.

Encouraged by results of helicopter logging tests in other parts of the country, loggers in the East have been performing their own trials. There have been few helicopter logging operations in the eastern U.S. but a recent test in the Allegheny National Forest was efficient; there were few major delays. The average daily production rate for the entire operatio was 205.90 m^3; the daily cost to the sawmill was $4,327.00.

153. Flower, Franklin B., Ida A. Leone, Edward F. Gilman, and John J. Arthur.
1977. Landfill gases and some effects on vegetation. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-2 p. 315-322.

Gases from refuse landfills moving through soil were studied in New Jersey. The gases, products of anaerobic decomposition of organic matter in the refuse, injured and killed peach trees, ornamentals, and commercial farm crops. They are potential hazard to life and property because combustible gases can seep into residences. Remedial measures are describe

154. Frank, Robert M.
1977. Silvicultural options for obtaining high yields in spruce-fir. In High-yield forestry in northern hardwoods, spruce-fir and white pine. 24th Annu. Meet. Soc. Prot. N.H. For. Nov. 21, 1975, Concord. p. 5-9.

Presently, the selection, shelterwood, and clearcutti systems of silviculture are recommended for regenerating spruce-fir stands from seed. Future tending,

harvesting, and replacement may resemble farming, especially on better sites. Increases in yield from genetically improved growing stock, fertilization, intermediate cultural treatments, and full-tree harvesting may be more efficiently realized with even-age management. If multiple use of most of the forested area is the landowner's objective, uneven-age management is more efficient.

155. Frank, Robert M.
1977. Indications of silvicultural potential from long-term experiments in spruce-fir types. In Proc. Symp. Intensive Culture of Northern Forest Types. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-29. p. 159-177.

Data collected since the 1950s from commercial treatments on more than 400 acres in the Penobscot Experimental Forest in Maine indicate a high mortality rate --520 percent of net growth--in the woodland preserve where timber is not harvested, and a low mortality rate--16 percent of net growth--under the selection system. As the intensity of silvicultural treatment increased, periodic net annual growth increased from 10 cubic feet per acre (0.7 m^3/ha) in the woodland preserve to 56 cubic feet per acre (3.9 m^3/ha) under the selection system.

156. Gabriel, William J.
1978. Genetic variation in seed and fruit characters in sugar maple. U.S. Dep. Agric. For. Serv. Res. Pap. NE-404. 4 p., illus.

Genetic variation was found in dry weight of seed and percentage of filled fruit. Relations between latitude, percentage of filled fruit, and dry weight of seeds were variable; dry weight of seed exhibited a complex pattern of genetic variation.

157. Gabriel, William J., and Donald W. Seegrist.
1977. Phenotypic variation in sap sugar among sugar maple stands in Northeastern United States. Northeast. For. Tree Improv. Conf. Proc. 24: 41-49.

Sugar maple stands showed a high degree of heterogeneity in sugar content in sap. Differences within and between stands, and between states, were statistically significant. Two broad populations, based on sugar production, were apparent. Production in grazed and roadside stands was significantly higher than that in ungrazed stands, suggesting that stress may be important in sap sweetness of trees. Sugarbush means and standard deviations were correlated. Selection differentials for 43 selected trees averaged 2.54. Average sap-sugar content of trees in the study area was 2.5 percent. Plus trees were selected by the comparison-tree method.

158. Garbriel, William J., and Donald W. Seegrist. 1977. Differences in sugar content of sugar maple sap in northeastern United States. Natl. Maple Syrup Dig. 16(3): 8-10.

A high degree of difference was found in the sugar content in sap among sugarbushes in a 6-state area of the northeastern United States. Differences were statistically significant within and between states. Sugarbushes grazed by livestock or located along roads consistently produced sweeter sap than ungrazed bushes.

159. Galford, Jimmy R. 1977. Attempt at concentrating red oak borer eggs by providing artificial oviposition sites. U.S. Dep. Agric. For. Serv. Res. Note NE-232. 2 p.

Thirty-eight scarlet and 14 black oaks were spirally wrapped to a height of about 2 m with black or white cotton tape 2.5 cm wide in an attempt to increase oviposition of the red oak borer, Enaphalodes rufulus (Haldeman), on selected trap trees. However, only 57 eggs were laid under tape on 17 of the trees, all scarlet oaks. Attacks but no eggs were found on some of the wrapped black oaks.

160. Galford, Jimmy R.
1977. Evidence for a pheromone in the locust borer. U.S. Dep. Agric. For. Serv. Res. Note NE-240. 3 p.

Laboratory studies have suggested the existence of a pheromone in the locust borer. Male beetles spent more time on bolts of wood exposed to virgin females than on control bolts. The females apparently deposited the pheromone on the bolts of wood and on filter paper.

161. Galford, Jimmy R.
1978. A trap for tree-inhabiting cerambycids. U.S. Dep. Agric. For. Serv. Res. Note NE-258. 4 p., illus.

To determine species and numbers of insects visiting a tree, a paper trap for cerambycids was designed and tested on locust borers, Megacyllene robininae (Forster), and red oak borers, Enaphalodes rufulus (Haldeman), under plantation and forest conditions. Test results showed that the trap could be used successfully to capture locust borers but it requires some modification for red oak borers. Several other cerambycid species were also captured in the trap.

162. Gansner, David A., Owen W. Herrick, and Dietman W. Rose.
1977. Intensive culture on northern lands: trends, expectations, and needs. U.S. Dep. Agric. For. Serv. Res. Pap. NE-371. 8 p., illus.

Timber-stand improvement and commercial thinning are the practices most often used, and probably will continue to be. Increases in recent harvests due to intensive culture were estimated at about 4 percent. Managers expressed needs for more knowledge about genetic tree improvement, site preparation, fertilization, and species conversion.

163. Gansner, David A., Owen W. Herrick, and William B. White.
1978. Economic analysis of the gypsy moth proble in the Northeast. IV. Forest stand hazard ratin for gypsy moth. U.S. Dep. Agric. For. Serv. Res. Pap. NE-410. 3 p.

Provides a practical method for rating the potential hazard of impending gypsy moth attacks to forest stands. Stepwise multiple regression analysis is used to develop equations for estimating tree mortali from easy-to-measure key characteristics of stand condition.

164. Garrett, Lawrence D.
1977. Analysis of market factors associated wit sales of cut natural Christmas trees. U.S. Dep. Agric. For. Serv. Res. Pap. NE-364. 14 p., illu

Describes a study of natural Christmas tree retail marketing practices in Winston-Salem, N.C. Market analysis reveals that lots in areas of high retail activity sell more trees and obtain higher prices for trees sold.

165. Garrett, Lawrence D.
1977. Processing maple sugar with a vapor compression distiller: An economic analysis. U.S. Dep. Agric. For. Serv. Res. Pap. NE-385. 12 p., illus.

Evaluation of vapor compression distillers for processing maple syrup revealed that they are more energ efficient than conventional evaporators, produce syru of equal quality, and are effective in reducing total annual processing costs.

166. Garrett, Lawrence D.
1978. Production opportunities in Vermont. In Structural flakeboard from forest residues; proceedings of a symposium presented by the USDA Forest Service, June 6-8, Kansas City, Mo. U.S Dep. Agric. For. Serv. Gen. Tech. Rep. WO-5. p. 172-177.

Opportunities for production of structural flakeboard in Vermont exist both in the supply of raw material and marketing of the final product. An analysis of economic impact of such factors as raw material supply, plant size, and product market price indicate feasibility at existing factor input costs and product prices. The analysis also revealed profitability to be highly sensitive to raw material cost and final product price. Price increases from increased competition for wood resource for energy generation or paper products could cause significant increases from increased competition for wood resource for energy generation or paper products could cause significant increases in final product price. Market acceptance is strongly predicted on a competitive price line with 1/2-inch CDX plywood.

167. Garrett, Lawrence D.
1978. The economic implications of using wood space heaters for home comfort heat. In Wood heating seminar 3 proc., p. 390-415. (Presented by the Continuing Educational Program of the Wood Energy Inst. with the Energy Ext. Serv. Univ. WI, April 3-6, 1978).

168. Garrett, Lawrence D., Howard Duchacek, Mariafranca Morselli, Frederick J. Laing, Neil K. Huyler, and James W. Marvin.
1977. Increasing the efficiency of maple sap evaporators with heat exchangers. U.S. Dep. Agric. For. Serv. Res. Pap. NE-388. 12 p., illus.

A study of the engineering and economic effects of heat exchangers in conventional maple syrup evaporators indicated that: (1) Efficiency was increased by 15 to 17 percent with heat exchangers; (2) Syrup produced in evaporators with heat exchangers was similar to syrup produced in conventional systems in flavor and in chemical and physical composition; and(3) Heat exchangers reduce per-unit production costs, and can yield greater production and higher profits.

169. Garrett, Lawrence D., and Mariafranca Morselli.
1978. Mechanical compression evaporators. Natl. Maple Syrup Dig. 18(4): 20-23.

An analysis of a vapor compression evaporator for processing maple syrup revealed that: (1) it evaporated 1 pound of water with .047 pounds of steam equivalent; similar plant capacity using open-pan evaporators required 1.5 pounds of steam to produce 1 pound of water; (2) it produced a syrup quality equal to that produced in a conventional open-pan evaporation plant using identical sap; and (3) the operation of a central plant producing 8,000 gallons of syrup per year using a vapor compression evaporator should yield a return of 12 to 16 percent on investment.

170. Garrett, Lawrence D., and Thomas H. Pendleton. 1977. Selling natural Christmas trees in an urban market. Am. Christmas Tree J. 21(3): 23-27.

A study of marketing practices by retailers in Winston-Salem, North Carolina, and Denver, Colorado, revealed that marketing strategies associated with effective sales of other consumer goods are also effective in marketing natural Christmas trees. The study identifies marketing factors important to increased sales of natural trees, including locating near areas of high retail activity, providing better parking facilities, using effective advertising media, and marketing quality products.

171. Garrett, Lawrence D., and Thomas H. Pendleton. 1977. Developing models to forecast sales of natural Christmas trees. U.S. Dep. Agric. For. Serv. Res. Pap. NE-374. 5 p.

Describes models developed for forcasting natural Christmas tree sales in metropolitan areas. Factor and regression analysis were used to isolate the market factors most closely associated with tree sales. Models were tested to show their effectiveness in other market areas.

172. Garrett, P. W. 1977. Interspecific hybridization: the American experience. Proc. Symp. on Eastern Cottonwood and Related Species. p. 156-164.

On the basis of previous work with species and species hybrids of the genus Populus there is ample evidence to suggest that improved clonal material can be produced in a relatively short period of time. Based on diversity of germ plasm, species crossability, ease of clonal propagation, age of flowering and other factors, this genus offers the greatest potential for genetic improvement. If we are to meet the predicted demands for wood fiber, it may be through plantings near mill locations and on the best available sites. The genus Populus is ideally suited for this purpose.

173. Garrett, P. W.
1978. Eastern white pine selection and breeding. Pa. Christmas Tree Growers' Assoc. Bull. 140. p. 16-17.

174. Garrett, P. W., and A. L. Shigo.
1978. Selecting trees for their response to wounding. Metrop. Tree Improv. Alliance Proc. 1: 69-72.

175. Garrett, P. W., A. L. Shigo, and J. Carter.
1976. Variation in diameter of central columns of discoloration in six hybrid poplar clones. Can. J. For. Res. 6: 475-477.

The percentage of stem diameter discolored in the center of hybrid poplar logs varied by clones. For the six clones studied, discoloration columns ranged in percentage of total stem diameter from 85.0 to 55.8.

176. Gatchell, Charles J., Ronald E. Coleman, and Hugh W. Reynolds.
1977. Machining the serpentine end-matched joint. Furn. Design & Manuf. 49(6): 30-32, 34, illus.

The serpentine end matched joint provides a method of obtaining greater yields from 2 Common and poorer lumber, using the precise machining afforded by numerical controlled routers. These routers can easily be

programmed with the aid of a computer. The machining of serpentine end matched joints in three preferred hardwood species has been perfected.

177. Gatchell, Charles J., Ronald E. Coleman, and Hugh W. Reynolds.
1977. Machining the serpentine end matched joint--a tool for improved utilization of low-grade lumber. Proc. 5th Annu. Hardwood Symp. Hardwood Res. Counc. p. 63-68, illus.

Serpentine end-matching joins two pieces of wood with an esthetically pleasing sine-wave-shaped butt joint. This new application for numerically controlled routers may increase the desirability of 2 Common lumber as a raw material. Problems encountered and overcome in machining the joint in black walnut, black cherry, and northern red oak are described. Values of machining variables for "perfect" joints in these species are listed.

179. Gerhold, H. D., and W. D. Bartoe II.
1976. Performance testing tree cultivars in metropolitan environments. J. Arboric. 2(12): 221-227.

180. Gibson, Lester P.
1977. Elm phloem necrosis distribution. Plant Dis. Rep. 61: 402-403, illus.

The author used a map to compare the known distribution of elm phloem necrosis in 1946 with that observed from 1971 to 1976. Observations made from 1971 to 1976 showed the incidence of phloem necrosis was on the increase and its distribution was expanding northeastward as well as southward.

181. Gibson, Lester P.
1977. A new genus of Blacinae (Hymenoptera: Braconidae). Pac. Insects 17(2-3): 241-245, illus.

A new genus, Canalicephalus, of the subfamily Blacinae is described along with four new species, C. orientalis from Borneo, C. novus from New Guinea, and C. bakeri and C. mindanao, both from the Phillippines. Keys are included to separate these two genera and the four species.

182. Gibson, Lester P.
1977. Monograph of the genus Curculio in the new world (Coleoptera: Curculionidae). Part II. Mexico and Central America. Misc. Publ. Entomol. Soc. Am. 10(4). 52 p.

Detailed morphological and taxonomic characteristics of the genus Curculio L. are presented for all new species and general information is presented for all species known to occur in Mexico and Central America. A key to species is included. Twenty-seven species are included, of which 18 are described as new.

183. Glass, Norman R., Gene Likens, Leon Dochinger.
1978. The ecological effects of atmospheric deposition. (Abstr.) 3rd Natl. Conf. Interagency Energy/Environ. R&D Program. U.S. Environ. Prot. Agency. Washington, D.C. p. 7.

An increasing deposition of beneficial and injurious concentration of wet and dry acidic substances has occurred during the past two decades. Approximately 60% of the acidity in rainfall is attributable to acid sulfates and 40% to acid nitrate compounds. Impacts of acidity deposition on biosphere are reviewed and effects on ecological processes are discussed.

184. Godin, V. B., and R. E. Leonard.
1976. Guidelines for managing backcountry travel and usage. Trends. June, p. 33-37.

Methods for influencing the backcountry recreationist's choice of trail and campsite locations do not have to be of a prohibitive or regulatory nature. Four types of "barriers" for usage are discussed: administrative, oral, written, and natural. The last three methods are the least obtrusive and may be as effective in limiting use on fragile sites as the currently used, more expensive permit and reservation systems.

185. Godin, V. B. and R. E. Leonard.
1977. Who is violating the law of the land. Appalachia 41(4): 8-23.

186. Godin, V. B., and R. E. Leonard.
1977. Design capacity for backcountry recreation management planning. J. Soil Water Conserv. 32: 161-164.

Recreation managers are seeking ways to determine how many people a backcountry site can accommodate before resource degradation occurs. A "design capacity" approach to this problem offers more planning flexibility than the "carrying capacity" approach. The capacity of a site would depend not only on the ecological setting, but also on the amount of site maintenance that can be applied to reduce physical damage. An inventory of current backcountry maintenance costs would allow the forest manager to plan use levels and maintenance needs within his management area.

187. Godin, V. B. and R. E. Leonard.
1977. Design capacity for management decision-making. Proc. Quant. Ecol. Workshop, Coll. Life Sci. and Agric., Univ. N. H., Durham. p. 53-54.

188. Godin, Victor and Raymond Leonard.
1977. Permit compliance in eastern wilderness: Preliminary results. U.S. Dep. Agric. For. Serv. Res. Note NE-238. 3 p.

seedlings were outplanted on a cleared forest site in mid-July. Seedling survival for all treatments after two growing seasons was very good (98.8 percent). The effects of container size and soil mix were relatively small and statistically significant only at the time of outplanting. Paper birch seedlings grew much more rapidly than the yellow birch. An early August outplanting of red maple seedlings was added to the study. Growth and survival of the red maple was similar to that of the birches.

195. Graber, Raymond E., and Donald F. Thompson.
1978. Seeds in the organic layers and soil of four beech-birch-maple stands. U.S. Dep. Agric. For. Serv. Res. Pap. NE-401. 8 p., illus.

Seeds contained in forest floor samples from four northern hardwood stands aged 5, 38, 95, and 200+ years were germinated. Thirty-five species of herbs, shrubs, and trees were identified. Seed numbers of the early successional species Rubus and pin cherry (Prunus pensylvanica L.f.) were highest in the two younger stands. If short rotations are used for timber harvesting, these plants may cause reduced stocking of high-value timber species.

196. Gratzer, Miklos A., James E. Sutherland, and Robert T. Throssell.
1978. Recreation in the Poconos: images and perceptions. Syracuse Univ. and New York Coll. of Environ. Sci. and For. Unnumbered Bull. 32 p.

197. Graves, Paul F., and Gilbert P. Dempsey.
1976. Forest economics, policy and program research priorities in the Northeast. Northeast Regional Plann. Comm. Res. Rep. 2.09, 40 p.

A cooperative product of the Northeast's land-grant universities and the Forest Service, the report delineates the need for research efforts in the realm of resource economics, policy, and programs to help develop an optimum interrelationship between

the Northeast's forest land, other resources, and people. The focus is upon processes critical to forest resource planning that encompass broad social considerations. Problem areas that require extensive research include public use conflicts, production of goods and services, management information systems, interorganizational relations, taxation, and research methodology.

198. Greene, John L.
1977. Two publicly sponsored assistance programs using private consultants. The Consultant 22(3):56-59.

199. Gregory, Garold F.
1977. Therapy and prophylaxis of Dutch elm disease (DED) by pressure injection of methyl 2-benzimidazole carbamate hydrochloride. (Abstr.) Am. Phytopathol. Soc. 3: 268.

200. Gregory, Garold F.
1977. Perspectives in DED control: 1977. In: Nat. Arborists Assoc. Symp. No. 1, The current state of the art of Dutch elm disease control, p. 32-35.

201. Gregory, R. A.
1977. Cambial activity and ray cell abundance in Acer saccharum. Can. J. Bot. 55: 2559-2564, illus.

The ray cell population of sugar maple wood is important because much of the sucrose found in maple sap is converted from starch stored in these cells, we found. We found that we could silviculturally manipulate the ratio of ray cells to other cell types by controlling radial growth rate; the unit area population of ray cells rose abruptly with accelerating growth rate. When fast growth was not maintained, the unit area population of ray cells slowly declined.

202. Gregory, Robert A.
1978. Living elements of the conducting secondary xylem of sugar maple (Acer saccharum Marsh.). Int. Assoc. Wood. Anat. Bull. 4:65-69, illus.

Living cell types of the conducting xylem of sugar maple were studied as a single interconnected protoplasmic unit (the symplast) to help understand and identify the mechanisms that control sap flow and secretion of sugar into sap. There are numerous cell types within the symplast which function in various ways, including storage, transport, secretion, and mechanical support.

203. Gregory, Robert A., and J. A. Romberger.
1977. The shoot apical ontogeny of the Picea abies seedling. IV. Protoxylem initiation and age of internodes. Am. J. Bot. 64: 631-634.

In Picea abies seedlings the distance below the base of the shoot apical dome to the first protoxylem (px) to be differentiated in the internodes beneath is a linear function of apical dome basal diameter. The morphogenic age in plastochrons and the chronometric age in days of the internode in which px is first differentiated were computed. As the seedlings age from 30 to 140 days, the distance from the base of the apical dome to px increases from 186 to 295 μm, the n of n_{px} increases from 16 to 53, but the chronometric age of n_{px} remains within the range of 10 to 12 days.

204. Grisez, Ted J.
1978. Pruning black cherry in understocked stands. U.S. Dep. Agric. For. Serv. Res. Pap. NE-395. 9 p., illus.

Black cherry trees 4 to 6 inches in dbh with live crown ratios ranging from 73 to 92 percent were pruned to 25, 50, or 75 percent of tree height or were left unpruned. Most trees can be pruned to 50 percent of tree height in one operation. Trees that have large crowns and that are fully exposed on the southwest side should be pruned less severely. Pruning to 75 percent of tree

height caused excessive epicormic branching, poor diameter growth, and serious inner bark and cambium necrosis.

205. Hacskaylo, E.
1976. Mycorrhizae in nursery management. Proc. 1974 Northeast. Nurserymen's Conf. p. 27-34.

Mycorrhizal associations are usually classed as ecto-, ectendo- and endomycorrhizae. These associations are essential in establishing vegetation in most habitats. Drained peat bogs in Sweden, Anthracite coal spoils, and soils in tropical Puerto Rico are areas where research has proved their value in tree survival. The fungi could be advantageously used for seedling nursery and container inoculum. Research is in progress to develop efficient means for their pratical use.

206. Hacskaylo, E.
1976. Activities within mycorrhizal associations at the root-soil interface. Proc. 16th IUFRO. p. 78-79. Oslo, Norway. 1976.

Exchanges of metabolites between tree roots and adjacent soil are usually intermediated by associated mycorrhizal fungi. The extent to which metabolites are modified while transversing the mycorrhizal system is only partially known. Nutrient uptake, carbohydrate metabolism, production of growth regulators and antibiotics and many other biotrophic interactions must be researched further in the laboratory and in natural environments.

207. Hacskaylo, E.
1977. Persistence and fruiting of ectomycorrhizal fungi in Puerto Rico. Proc. 3rd North Am. Conf. on Mycorrhizae. p. 54.

208. Hacskaylo, E.
1977. The role of root metabolites in ectomycorrhizal associations. Second Int. Mycol. Congr. 1: 256.

209. Hacskaylo, Edward.
1977. Review of Endomycorrhizas, F. E. Sanders, Barbara Mosse, and P. B. Tinker (eds). Mycologia 69: 212-214.

This book is a compilation of papers presented at a symposium on endomycorrhizae at the University of Leeds in July, 1974. There is a heavy emphasis on responses of plants to infections by vesicular-arbuscular mycorrhizal fungi, but orchid and ericaceous endomycorrhizae also are included.

210. Hacskaylo, E.
1978. Response of pine roots to growth substances. (Abstr.) Program abstracts, Joint Meeting IUFRO Working Party S2-01-13 and French Group for Root Studies. Nancy, France, Sept. 1978.

211. Hale, Kathy N., and David S. Canavera.
1977. Preliminary results of a white spruce (Picea glauca (Moench) Voss) half-sib progeny test in Maine. Proc. 25th Northeast. For. Tree. Improv. Conf. p. 94-103.

212. Halverson, Howard G.
1977. Potential urban runoff disposal in urban forests. (Abstr.) Am. Water Resour. Assoc. 1977 Conf., Tucson, Ariz. p. 15.

213. Hanks, Leland F.
1977. Hardwood tree grades and a plan for their implementation. Proc. 5th Annu. Hardwood Symp. Hardwood Res. Counc. p. 69-73.

Forest Service Hardwood Tree Grades for Factory Lumber, developed through research, are accompanied by board-foot lumber grade yields for 11 major hardwood species. Those conducting forest inventories or timber sale appraisals will find the grades useful. A plan for implementing use of the tree grades is also discussed; it may be followed by researchers working with both State and extension foresters to implement results of research.

214. Hanks, Leland F.
1977. Predicted cubic-foot yields of lumber, sawdust, and sawmill residue from the sawtimber portions of hardwood trees. U.S. Dep. Agric. For. Serv. Res. Pap. NE-380. 23 p.

Prediction equations and tables are given for estimating the gross cubic-foot volume of sawtimber for hardwood trees, and cubic-foot yields of lumber, sawdust, and sawmill residue that are produced during the sawing process. Yields are presented for northern red oak, black oak, white oak, chestnut oak, red maple, sugar maple, yellow-poplar, yellow birch, paper birch, and basswood.

215. Hansen, Bruce G.
1976. The ABC of trends in the Christmas tree industry. In Proc. Cornell Univ. School for Christmas Tree Growers, Ithaca, NY. p. 1-18, illus.

This article discusses the evolution of the American Christmas tree industry, with particular attention to changes in the American import market, the manufacture of artificial trees, and the American Christmas tree plantation during the past 20 years. In addition, the article provides a detailed look at recent operating characteristics of plantations in New York state.

216. Hansen, Bruce G.
1977. Goal programming: A new tool for the Christmas tree industry. U.S. Dep. Agric. For. Serv. Res. Pap. NE-378. 4 p.

Goal programming (GP) is applicable to decision-making in the natural Christmas tree industry. Its application is illustrated by a hypothetical decision facing two growers with different interests. A simplified presentation of the GP model plus an extended discussion of GP's suitability to the Christmas tree industry is included.

217. Hansen, Bruce.
1978. A new tool: goal programming. Am. Christmas Tree J. 22(3): 42-44.

Changes in the Christmas tree industry over the past 20 years have greatly increased the number, complexity, and importance of decisions made by Christmas tree growers. Using a hypothetical example, Goal Programming is offered as a tool to assist growers in the decisionmaking process. Through the application of Goal Programming, a variety of alternatives can be clearly delineated leading to a choice that gives explicit recognition to the trade-offs involved between achieving stated goals and working within given resource limitations.

218. Hansen, Bruce G., and Charles J. Gatchell.
1978. Serpentine end matching: A test of visual perception. U.S. Dep. Agric. For. Serv. Res. Pap. NE-408. 5 p., illus.

In tests of gross perception of serpentine end matched (Sem) joints in oak and cherry display panels, there were no significant differences between the number of times the non-Sem panels were chosen and the number of these selections that could be attributed to chance. Results of separate tests of sensitivity of perception of Sem joints showed that the most conspicuous joints in oak and cherry panels were chosen most often, and that the least conspicuous joints were detected least often. Given proper selection of pieces to be end matched, and moderate finishing, Sem joints are difficult to detect--even by those who are well-informed about Serpentine end matching.

219. Hay, C. J.
1976. Predisposition of woody vegetation to insects. In Air pollution and metropolitan woody vegetation. U.S. Dep. Agric. For. Serv. Pinchot. Inst. Environ. For. Study. p. 33-34.

220. Hay, C. John.
1977. The effects of insects and air pollutants on the health and survival of trees. Am. Nurseryman 146(9): 13, 109-114.

Low levels of air pollutants may possibly predispose trees to added insect stress. Virtually all feeding types of insects have been implicated. Scientists specializing in tree genetics, insects, diseases, and physiology at the USDA's Delaware, Ohio, research laboratory and at the Wooster, Ohio, OARDC laboratory are searching forest and shade tree species for specimens that are tolerant to several stress factors, including insects and air pollution.

221. Hay, C. John.
1977. Bibliography on Arthropoda and air pollution. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-34. 16 p.

This bibliography contains 227 references to literatur published through 1976 concerning observations or experiments involving Arthropoda in association with gases and particles that pollute the air. References are listed in three sections: review papers, laboratory research, and field research. They are arranged by type of air pollutant: ozone, sulfur oxides, fluorides, and other pollutants. Each reference is indexed by tree host and arthropod species.

222. Hay, C. John, and Keith F. Jensen.
1977. Fumigation effects of SO_2 on pine needle scale infestations on eastern white pine. (Abstr.) Proc. Am. Phytopathol. Soc. 3: 305.

223. Healy, William, and E. Nenno.
1978. Turkey broods and hairy snoods. Turkey Call 5(3): 12-17.

What factors affect wild turkey productivity and survival? The complex interactions among weather habitat, predators, and poult survival were illustrated for sportsmen by describing what happened to 11

radio-tagged hens during the nesting and brood-rearing season. Habitat management is shown to be a long term effort. Annual fluctuations caused by weather are beyond our control and in the long run, the attitudes and actions of people toward turkeys will determine the success of habitat management.

224. Heichel, G. H., and Lester Hankin.
1977. Retention of particulate lead on foliage and twigs of a white pine windbreak. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 333-339.

The removal of particulate lead from the air by a 27-m-deep roadside windbreak of white pine containing eight rows of 25-year-old trees was studied. Knowledge of particulate trapping and retention was gained by atomic absorption spectrophotometry of the lead burden of foliage and twigs of various ages adjacent to and far from the road. The effectiveness of the windbreak was also shown by comparison of the lead content of the soil beneath the windbreak with that of an adjacent open, undisturbed field.

225. Heisler, Gordon M.
1977. Discussion of "Amelioration--How trees reduce energy loss in cities." Proc. Sci. Am. For. 1977: 67-70.

Trees have significant potential for reducing energy loss in cities--perhaps on the order of 1% of national energy consumption. At the mesoscale, the effect of trees on city temperatures and wind flow would determine the reduction in energy loss, but the effect of trees on citywide energy loss has not been quantified. By providing protection from sun and wind, trees definitely have great potential for reducing energy loss for individual buildings, particularly on relatively open sites. The upper limit for year-round energy saving by optimum placement of trees around individual buildings is probably about 25%. Proper arrangement of trees on building sites is important.

226. Heisler, Gordon M.
1977. Trees modify metropolitan climate and noi J. Arboric. 3(11): 201-207, illus.

Human comfort in urban areas is altered by trees primarily through their influence on the exchange of radiant energy--both solar and long-wave. Although urban trees probably use large amounts of heat for transpiration, this process does not result in significantly cooler air in the vicinity of single trees or small groups of trees; even low winds quickly disperse the cooled air. Outdoor spaces that receive heavy pedestrian use should be made as versatile as possible by providing both sunny and shady sites for sitting and walking. Windbreaks may reduce energy requirements for heating buildings by 10 to 25%. Although shade obviously is a benefit in summer, wint shade is a disadvantage, and even deciduous trees create significant shade in winter. Trees are useful for noise control primarily because they scatter soun waves which are then absorbed by the ground. Dense forests or plantings of trees can reduce transmission of traffic noise, but if highways carrying high-speed truck traffic pass through residential areas, tree barriers alone cannot reduce sound levels to an acceptable level within about 350 feet of the highway

227. Hendrix, William G.
1977. Visual land-use compatibility and scenic-resource quality. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 415-421.

The effect that land-use relationships have upon perceived quality of the visual landscape is discussed, and a case is made for expansion of fit-misfit theory into what has been called visual land-use compatibili An assessment method that was designed to test people perceptions of land-use relationships is presented and the results are discussed.

228. Herrick, Owen W.
1977. Impact of alternative timber management policies on availability of forest land in the Northeast. U.S. Dep. Agric. For. Serv. Res. Pa NE-390. 14 p., illus.

Gaging the ability of the forest resource to satisfy future timber requirement is central to solving many problems arising from competition for use of forest land. In this study, production potentials of forest acreage in the Northeastern United States under management alternatives that range from extensive to intensive are weighed against several estimates of timber requirements for the year 2000. The different capabilities for fulfilling timber requirements in different parts of the region indicate areas likely to be affected most by further shifts toward nontimber use of forest land.

The intermediate option for forest management combines forest management at the present level with emphasis on harvesting the best timber-growing sites first. This option could meet timber requirements for year 2000 with roughly half the region's commercial forest area. Moreover, it could accommodate both intensive management and multiple-use objectives where they are most applicable by allowing flexibility in forest land-use decisions.

229. Herrington, Lee P., and C. Brock.
1977. Propagation of noise over and through a forest stand. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 226-228.

Measurements of the two-dimensional acoustic field in a forest resulting from a source located outside the forest indicated that the attenuation pattern near the ground is significantly different from the pattern higher up in the forest. The patterns of attenuation support the recent theory that the forest floor is the main absorber of acoustic energy in the forest.

230. Herrington, L. P., and Gordon M. Heisler.
1976. Conference on metropolitan physical environment: Vegetation, space, and structure for human amenities. Bull. Am. Meteorol. Soc. 57: 696-699.

Scientists and urban planners, designers and managers participated in a 5-day conference in Syracuse, New York, in August 1975. Urban micro- and mesoclimate,

outdoor acoustics, air quality, and "qualitative" aspects of the urban environment were discussed in 53 presentations. At least 20 presentations contained information about urban meteorology and climatology including volunteer weather-observation networks, surface-level temperatures, thermal structure of urban atmospheres, precipitation in urban areas, urban moisture, and urban microclimate. The Forest Service, State University of New York, and the American Meteorological Society sponsored the conference. Proceedings have been published in U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25.

231. Herrington, Lee P., and J. S. Vittum.
1977. Human thermal comfort in urban outdoor spaces. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 130-138.

Measurements of the physical environment of urban open spaces in Syracuse, New York, were used to compute the physiological responses of human users of the spaces. These calculations were then used to determine what environmental variables were both important to human comfort and susceptible to control by site design. Although air temperature and humidity are important to human thermal comfort, these variables were found not to be related in any way to site features; temperature and humidity in the central business district were uniform over space. The other variables found to be important to human thermal comfort are, in order of importance: solar radiation, infrared radiation, and wind speed. We found that all of these can be controlled to some extent by site design. Thus site design can be used to control human thermal comfort in outdoor urban spaces.

232. Hewlett, J. D., G. B. Cunningham, and C. A. Troendle.
1977. Predicting stormflow and peakflow from small basins in humid areas by the R-index method. Water Resour. Bull. 14: 231-254.

233. Hilt, Donald E.
1977. Introduction of black walnut and northern red oak seedlings in an upland hardwood forest in southeastern Ohio. U.S. Dep. Agric. For. Serv. Res. Note NE-241. 5 p., illus.

Black walnut and northern red oak seedlings were planted on a clearcut area in 1964. Three cultural treatments were applied to seedlings to control competing trees. Average height and survival were analyzed 13 growing seasons after planting. Results indicated that black walnut seedlings can be effectively established on good sites if cultural treatments are applied. Red oak seedlings are difficult to establish regardless of treatment or site.

234. Hilt, Donald E., and Donald W. Seegrist.
1977. RIDGE: A computer program for calculating ridge regression estimates. U.S. Dep. Agric. For. Serv. Res. Note NE-236. 7 p.

Least-squares coefficients for multiple-regression models may be unstable when the independent variables are highly correlated. Ridge regression is a biased estimation procedure that produces stable estimates of the coefficients. Ridge regression is discussed, and a computer program for calculating the ridge coefficients is presented.

235. Holt, Coleman.
1978. The effect of deer population on natural regeneration in the Allegheny Plateau region. Allegheny News, Soc. Am. For. p. 9.

236. Hornbeck, James W.
1977. Forests and water quality. In W. E. Sopper, J. A. Lynch, and E. S. Corbett, eds. Water resources at the forest-urban interface. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Res. PA-2. p. 11-13.

Water draining from essentially undisturbed forests usually represents a base line for high quality water.

This is due to the protection the forest cover provide against erosion and sedimentation, leaching of nutrients, and excessive heating of stream water by solar radiation. Man-made or natural disturbances can interrupt or eliminate this protection and cause forests to become non-point sources of water pollution. This paper reviews the pertinent literature and categorizes research needs.

237. Hornbeck, James W.
1977. Nutrients: A major consideration for intensive forest management. In Proc. Symp. Intensive Culture of Northern Forest Types. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-29: 241-250.

Estimates of nutrient losses from a stem-only harvest are compared with those from a whole-tree harvest of a clearcut northern hardwood stand. Combined nutrient losses due to increased leaching and removal of vegetation after stem-only harvesting are estimated to be 334 kg/ha for calcium and 265 kg/ha for nitrogen. For a whole-tree harvest, combined losses are estimate at 537 kg/ha for calcium and 486 kg/ha for nitrogen. Replenishment of available calcium and nitrogen could be a problem, depending upon the rates of soil mineralization and natural replacement.

238. Hornbeck, James W., Gene E. Likens, and John S. Eaton.
1977. Seasonal patterns in acidity of precipitation and their implications for forest stream ecosystems. Water, Air, and Soil Pollut. 7: 355-365. (Reprinted from Gen. Tech. Rep. NE-23, 1976.)

At the Hubbard Brook Experimental Forest in New Hampshire, the mean hydrogen ion content of precipitation ranges between 46 μeq/l in winter and 102 μeq/l in summer. As summer precipitation passes through the forest canopy, hydrogen ion concentrations are lowered by an average of 90 percent, primarily as a result of exchange with other cations.

239. Hornbeck, James W., and Robert S. Pierce.
1978. Acidity of rain and snow: a potential problem for New Hampshire. N.H. For. Notes 131: 6-7.

The Hubbard Brook studies have characterized the chemistry of precipitation falling on New Hampshire and have identified and defined some of the potential impacts. A major finding is that precipitation is acidic, largely as a result of human activities. The more obvious impacts, such as leaching of nutrients from foliage, have been determined, but many of the more subtle impacts will require further study.

240. Horsley, Stephen B.
1977. Allelopathic inhibition of black cherry by fern, grass, goldenrod, and aster. Can. J. For. Res. 7: 205-216, illus.

Small black cherry (Prunus serotina Ehrh.) seedlings grow slowly and soon die in low-density cherry-maple (Acer rubrum L.) orchard stands colonized by a dense ground cover of bracken fern (Pteridium aquilinum L.), wild oat grass (Danthonia compressa Aust.), goldenrod (Solidago rugusa Ait.), and flat-topped aster (Aster umbellatus Mill.). Studies of orchard stand persistence indicated allelopathic interference between black cherry seedlings and the herbaceous ground-cover plants. Foliage extracts of fern, goldenrod, and aster inhibited seed germination; aster foliage extract inhibited both shoot and root growth of seedlings growing on cotyledonary reserves; foliage extracts of fern, grass, goldenrod, and aster and root washings of goldenrod and aster inhibited shoot growth and dry weight accumulation of seedlings that had exhausted cotyledonary reserves. Soil from the upper horizons of an orchard stand did not moderate the toxicity of the herbaceous foliage extracts or root washings.

241. Horsley, Stephen B.
1977. Allelopathic interference among plants. II. Physiological modes of action. Proc. 4th North Am. For. Biol. Workshop. SUNY Coll. Environ. Sci. For., Syracuse. p. 93-136.

Few of the many allelopathic plant chemicals have been investigated; of these, terpenoids are the most important in arid and semiarid environments and phenolic compounds, especially the benzoic and cinnamic acids and coumarins, in temperate ecosystems. Most of these chemicals ultimately find their way into the soil, where they may be diminished and transformed. Much more research is needed.

242. Horsley, Stephen B.
1977. Woodland grasses, ferns, and club moss also have inhibitory allelopathic effect on black cherry. Can. J. For. Res. 7: 515-519.

On poorly drained Allegheny hardwood sites on the Allegheny Plateau of northwestern Pennsylvania and southwestern New York, hay-scented fern, New York fern, and short husk grass spread rapidly when stands are shelterwood cut to stimulate production of advance regeneration. Club moss does not spread rapidly, but is sometimes found in large patches. A comparison of paired field plots showed that the presence of any of these herbaceous species was correlated with reduced numbers of black cherry seedlings. In a greenhouse study, foliage extracts of hay-scented fern, New York fern, and short husk grass inhibited shoot growth of black cherry seedlings that had exhausted cotyledonary reserves.

243. Horsley, Stephen B.
1978. Allelopathic inhibition of forest regeneration. Allegheny News, Spring 1978. p. 12.

244. House, Michael C.
1977. Determination of relationships between climate, relief, species, and spoil material on tree development and soil formation at three locations in eastern Ohio. M.S. thesis. Ohio State Univ., Columbus.

245. Houston, D. R.
1977. Studies on Gonatorhodiella highlei, a mycoparasite of Nectria spp. associated with beech bark disease in England and North America. (Abstr.) Proc. Am. Phytopathol. Soc. 3: 306.

246. Houston, D. R.
1977. Protection against beech scale, Cryptococcus fagi, by Dichaena rugosa, a bark fungus of European and American Beech. (Abstr.) Proc. Am. Phytopathol. Soc. 3: 306.

247. Houston, D. R., and L. S. Dochinger.
1977. Effects of ambient air pollution on cone, seed, and pollen characteristics in eastern white and red pines. Environ. Pollut. 12: 1-5.

Assessments are lacking on the effects of continuous, ambient exposures of air pollution on the reproductive capabilities of forest trees. Significantly lower values were observed for white pine in polluted sites for number of seeds per cone, 100-seed weight, and percent pollen germination. In red pine, cone length, 100-seed weight, percent filled seed, percent seed germination, percent pollen germination, and pollen tube length were significantly lower in the polluted area. These findings suggest that sublethal concentrations of pollution may influence reproductive tissues of pines without causing visible foliage injury.

248. Houston, David R., and Harry T. Valentine.
1977. Comparing and predicting forest stand susceptibility to gypsy moth. Can. J. For. Res. 7: 447-461.

One hundred sixty-eight forest stands in the northeastern United States with different histories of defoliation and responses to defoliation by the gypsy moth were compared by principal components analysis (PCA) ordinations. The ordinations were based on tree structure feature variables. Tree mortality after defoliation often was greater in the resistant wet bottom and mesic slope and ridge stands than in the

susceptible dry ridge and sand stands. Our ordinatio suggest that some stands, as a consequence of high oa mortality, may now be more resistant than before.

249. Hoy, M. A.
1976. Establishment of gypsy moth parasitoids in North America: An evaluation of possible reasons for establishment or non-establishment. In Perspectives in Forest Entomology. J. Anderson and H. Kaya, Editors. Academic Press, New York. Chapter 15, p. 215-232.

250. Hoy, Marjorie A.
1977. Rapid response to selection for a non-diapausing gypsy moth. Science 196(4297): 1462-1463, illus.

A multivoltine gypsy moth strain solves insectary production problems. It may also be a potential new tool for genetic control of the gypsy moth, yet it might have hazardous side effects. It will be useful for physiological and genetic comparisons with the normal diapausing gypsy moth.

251. Hoy, Marjorie A.
1978. Variability in diapause attributes of insects and mites: some evolutionary practical implications. In Proceedings in life sciences: Evolution of insect migration and diapause. (H. Dingle, Ed.) Springer Verlag, New York. p. 101-126.

252. Hoy, Marjorie A.
1978. Selection for a non-diapausing gypsy moth: some biological attributes of a new laboratory strain. Ann. Entomol. Soc. Am. 71: 75-80.

A non-diapausing strain of the gypsy moth, Lymantria dispar (L.) was selected within 8 generations. Larvae of the 6th generation of this strain (SEL) and larvae hatched from eggs field-collected in Pennsylvania were

compared with respect to adult morphology, egg mass size, pupal weight, developmental rate, sex ratio, and susceptibility to infection with nuclear polyhedrosis virus. Apanteles melanoscelus Ratzeburg, a braconid parasite of the gypsy moth, was reared on the non-diapausing SEL strain to determine the rate at which the parasite entered diapause under laboratory conditions. Selection of the non-diapausing strain proceeded under an 18-h daylength, even though the gypsy moth is thought to be photoperiodically neutral. Some SEL larvae reared from instar I to adulthood under an 8-h daylength produced egg masses that hatched promptly under the 8h conditions, indicating that genetic selection has not simply shifted the gypsy moth's critical photophase.

253. Hoy, Marjorie A., and Nancy F. Knop.
1978. Development, hatch dates, overwintering success, and spring emergence of a "nondiapausing" gypsy moth strain (Lepidoptera:Orgyiidae) in field cages. Can. Entomol. 110: 1003-1008.

Newly-hatched larvae from a selected (S) "non-diapausing" gypsy moth strain and larvae from field-collected wild (W) eggs were reared in field cages in Connecticut, U.S.A. beginning May 1976 to determine developmental rates and interbreeding potential. Reciprocal and inter se matings between S and W moths were monitored to determine if hatch occurred during the fall and if S and reciprocal F_1 hybrid (SW, WS) eggs could successfully overwinter and hatch at an appropriate time the following spring. S eggs did hatch in the fall. Survival of SW, WS, and some S eggs over the Connecticut winter demonstrated that this non-diapause colony is not suitable for a genetic control program in which the non-diapause trait is expected to act as a conditional lethal.

254. Hoyle, M. C.
1977. High resolution of peroxidase-indoleacetic acid oxidase isoenzymes from horseradish by ioselectric focusing. Plant Physiol. 60(5): 787-793.

255. Hoyle, Merrill C.
1977. High yield forestry from the tree's point of view. N.H. For. Notes 129: 27-28.

The problems that limit quality and growth for paper and yellow birch in New Hampshire's soil and climate are given in brief outlines. A prescription to overcome these problems is suggested. This is followed by results of an early field trial, which indicated that fast growth with very short rotations and high quality can be realized.

256. Hoyle, Merrill C.
1978. Illustrated handbook for high resolution of IAA oxidase-peroxidase isoenzymes by isoelectric focusing in slabs of polyacrylamide gel. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-37. 26 p., illus.

Specific techniques are presented for high resolution of peroxidase-IAA oxidase isoenzymes in polyacrylamide gel slabs by isoelectric focusing in pH gradients. Banding patterns are entirely reproducible. pH gradients are linear and there is no "cathode shift." The enzyme stains are very sensitive to low catalytic activity. Since the extreme cathodic or anodic isoenzymes of peroxidase-IAA oxidase enzyme have isoelectric points beyond the limits of wide range carrier ampholytes, it was necessary to adopt a more realistic definition of run time. Also, a labeling scheme similar to that used in electrophoresis was adapted for isoelectric focusing by use of a standard "marker isoenzyme." The number of peroxidase-IAA oxidase isoenzymes revealed by this technique is more than twice that previously reported.

257. Hoyle, M. C.
1978. Optimum conditions for indoleacetic acid oxidase extraction from Betula leaves. Plant Physiol. 42: 315-320.

258. Huff, F. A.
1977. Mesocale features of urban rainfall enhancement. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 18-25.

Analyses of data from the first four years of a 5-year research project at St. Louis indicate a substantial enhancement of summer rainfall downwind of the urban-industrial complex. This anomaly appears to be caused primarily by the intensification of naturally occurring storm systems through the addition of heat and raindrop nuclei from the urban area. Most of the enhancement is associated with organized storm systems and is most pronounced during and after the period of maximum diurnal heating.

259. Hutnik, R. J., and Grant Davis.
1978. Reclamation of coal mined land in the United States as compared with the Ruhr. In Gordon T. Goodman and Michael J. Chadwick, eds. Environmental management of mineral wastes. Sijthoff & Noordhoff, Alphen aan den Rijn, Netherlands. p. 71-83.

Reclamation practices in the United States differ from those in the Ruhr district of Germany mostly because of the differences in geography and in stage of development of mining laws. Mining in the United States is conducted over wide ranges of climate, physiology, and geology as contrasted to the rather homogeneous geographic area of the Ruhr. Surface mining, underground mining, and open-pit operations are found throughout the coal fields in the United States, cut underground mining is dominant in the Ruhr.

260. Janerette, Carol A.
1978. The effects of soak temperature on sugar maple seed germination. U.S. Dep. Agric. For. Serv. Res. Note NE-269. 2 p., illus.

The temperature at which sugar maple seeds were soaked before stratification significantly influenced their

germination. Maximal germination was obtained when seeds were soaked at 4°C, but if seeds were soaked at 25°C, germination decreased and the stratification requirement increased.

261. Janerette, Carol A.
1978. An in vitro study of seed dormancy in sugar maple. For. Sci. 24: 43-49, illus.

Organ culture techniques were applied to sugar maple seeds and seed parts in an attempt to locate the site of dormancy regulation. The study material included the complete embryo with the seed coat (testa) intact, with the seed coat removed, and with the seed coat and cotyledons removed. Results of this study suggest a two-phase dormancy mechanism--one phase controlled by the seed coat and the other controlled by the cotyledons. This study also indicated that the stratification process affects seed parts other than the embryonic axis.

262. Janerette, Carol A.
1978. A method of stimulating the germination of sugar maple seeds. Tree Planters' Notes 29(2): 7-8, illus.

The method used to stratify sugar maple seeds significantly influenced the time required to surpass 95% germination. When seeds were stratified in aluminum foil packets, 95% germinated within 18 days after the onset of germination, with current methods germination took 46 days to reach 95%.

263. Jennings, Daniel T., and Mark W. Houseweart.
1978. Sexing spruce budworm pupae. U.S. Dep. Agric. For. Serv. Res. Note NE-255. 2 p., illus.

Spruce budworm pupae can be sexed by the location and shape of the genital opening. The opening spans the 8th abdominal segment in the female pupae and is found on the 9th segment in male pupae.

264. Jennings, Daniel T., and Mark W. Houseweart.
1978. Spider preys on spruce budworm egg mass. Entomol. News 89(7 & 8): 183-186.

A penultimate male Metaphidippus flavipedes (G. & E. Peckham) (Araneae: Salticidae) was observed feeding on an egg mass of the eastern spruce budworm, Choristoneura funiferana (Clem.) (Lepidoptera: Tortricidae).

265. Jensen, Keith F.
1976. Air pollutants affect physiology of woody plants. In Proc. 4th North Am. For. Biol. Workshop. SUNY Coll. Environ. Sci. For., Syracuse. p. 47-55.

Air pollution is becoming an important environmental stress factor. It can cause foliar injury, reduce plant growth and interfere with many physiological processes, but its mechanism of action is not completely understood. One suggestion is that the pollutants react with cell membranes inside the leaves and change the ion balance in the cells. This in turn causes many secondary reactions, such as reduced enzyme activity or increased respiration. The foliar injury or growth change is the integrated result of all these secondary reactions.

266. Jensen, Keith F.
1977. Sulfur dioxide affects growth of forest tree species. (Abstr.) Proc. Am. Phytopathol. Soc. 4: 89.

267. Jensen, Keith F., and Frederick W. Bender.
1977. Seedling-size fumigation chambers. U.S. Dep. Agric. For. Serv. Res. Pap. NE-383. 4 p., illus.

The design of fumigation chambers is described. Each chamber has individual temperature, humidity, light, and pollutant control. Tenperature is variable from 15 to 35°C and controlled within ±1°C. Humidity is

variable from 25 to 95 percent and controlled within ±3 percent. Seedlings have been successfully grown in these chambers for up to 3 months.

268. Jensen, Keith F., and Leland F. Hanks.
1976. Growth analysis of poplar cuttings fumigated with SO_2. (Abstr.) Proc. Am. Phytopathol. Soc. 3: 306.

269. Jewell, Kevin E.
1978. Soil forming factors and yellow-poplar seedling growth on eastern Ohio minesoils. M.S. thesis. Ohio State Univ., Columbus.

270. Jordan, James S.
1977. Deer populations of the Allegheny National Forest, 1974-1977. In: A seminar on the problem of deer and forest regeneration: papers presented at 1977 summer meeting, Plateau and Northern Hardwood Chapter, Soc. Am. For., Ridgway, Pa. p. 40.

271. Joyner, Spencer A., Jr., Raymond S. Bradley, and Robert E. Reiter, Jr.
1977. Topoclimatic aspects of developmental suitability in the metropolitan landscape. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 163-171.

A computer-based procedure for geographically identifying, rating, and ranking topoclimatic characteristics is described. The influences of topography, land use, and soils are considered and combined into a single composite topoclimate developmental suitability map drawn by a Cal Comp plotter. By allocating development to the most suitable topoclimate areas, the long-term energy costs of maintaining human health and comfort could be minimized.

272. Kinerson, R. S., and I. Bartholomew.
1977. Biomass estimation equations and nutrient composition of white pine, white birch, red maple, and red oak in New Hampshire. N.H. Agric. Exp. Stn. Res. Pap. 62, 8 p.

273. Kingsley, Neal P.
1977. The forest resources of Vermont. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-46. 58 p., illus.

A statistical and analytical report of the third forest survey of Vermont by the Forest Service. Statistical findings are based on the remeasurement of 1/5-acre plots and 10-point cluster plots. This report discusses and analyzes trends in forest-land area, timber volume, annual growth, and timber removals. Timber-products output by forest industries, based upon a canvass of industries in 1973, and the importance of timber and forests to the State's economy and environment are also discussed. The report also includes a discussion of the outlook for timber supplies during the next 30 years and forest-management opportunities in the state. Also included are 53 tables of statistical data.

274. Kingsley, Neal P., and Thomas W. Birch.
1977. The forest-land owners of New Hampshire and Vermont. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-51. 47 p., illus.

A statistical-analytical report of a mail canvass of the owners of privately owned commercial forest land in New Hampshire and Vermont, based on responses to a mail questionnaire. The study was conducted in conjunction with forest surveys of the two states. Trends in forest-land ownership and the attitudes and intentions of owners regarding reasons for owning forest land, timber management, timber harvesting, and recreational use are discussed.

275. Kingsley, Neal P., and Douglas S. Powell.
1978. The forest resources of Kentucky. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-54. 97 p., illus.

A statistical and analytical report on the third forest survey of Kentucky conducted in 1973, 1974, and 1975. Statistical findings are based on both remeasured and new 10-point cluster plots. The present status and trends in forest-land area, timber volume, and annual growth and removals are discussed. Timber-products output by forest industries, based upon a canvass of industries in 1974, and the importance of timber to the economy of the State also are discussed. The report includes a discussion of the outlook for timber supplies through 2004, and forest-management opportunities in the State. The status and importance of the nontimber forest resources of Kentucky are also discussed. Included are 75 tables of statistical data.

276. Kochenderfer, J. N.
1977. Area in skidroads, truck roads, and landings in the central Appalachians. J. For. 75: 507-508, illus.

In nine central Appalachian areas logged with wheeled skidders, there was 1 mile of road for every 19.8 acres; roads and landings occupied 10.3 percent of the area. In two areas logged with jammers, there was 1 mile of road for every 31.1 acres; roads and landings occupied 7.8 percent of the area.

277. Kochenderfer, J. N., and G. W. Wendel.
1978. Skyline harvesting in Appalachia. U.S. Dep. Agric. For. Serv. Res. Pap. NE-400. 9 p., illus.

The URUS, a small standing skyline system, was tested in the Appalachian Mountains of north-central West Virginia. Some problems encountered with this small, mobile system are discussed. From the results of this test and observation of skyline systems used in the western United States, the authors suggest some machine characteristics that would be desirable for use in the Appalachians.

278. Konheim, Arnold G.
1977. Community noise monitoring program. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 202-205.

There are numerous questions in regard to methods, instrumentation, and human and agency resources for community noise monitoring. The U.S. Environmental Protection Agency is currently in the process of seeking answers to these questions through research within the agency and by cooperation with other organizations, including the Department of Defense and the National Bureau of Standards. EPA hopes to have an acceptable protocol for community noise monitoring by July 1977, but there will still be a long-term need for more meaningful and efficient techniques.

279. Kopcewicz, J., and Z. Porazínski.
1976. Effect of blue light irradiation on metabolism of free and bound gibberellins in Scots pine (Pinus silvestris L.). Acta Univ. Nicolai Copernici, Biol. XVIII, Nauki Math.-Przyr. 37: 203-207,

Irradiation of 10-day-old Pinus silvestris seedlings with blue light for 36 hours greatly reduces the amount of bound gibberellins and increases the free gibberellins. The basis of these changes is not understood, but phytochrome is not necessarily involved. More research is needed to determine whether this can be developed into a useful treatment of seedlings.

280. Kopcewicz, J., Z. Zatorska, H. Kulikowska, and T. Szczésniek.
1977. Endogenous growth regulators in embryonic shoots of Scots pine at the time of male and female flower primordia initiation. Acta Soc. Bot. Pol. 56: 119-128.

The initiation of male strobiles in Pinus silvestris is correlated with a high content of gibberellins and a low level of auxins, the initiation of female

strobiles with the reverse condition. No direct correlation was found between the content of cytokinins or abscisic acid and the sex of early developing strobiles. More detailed studies are planned.

281. Koterba, Michael T., James W. Hornbeck, and Robert S. Pierce.
1977. Effects of sludge applications on soil water and vegetation in a northern hardwood forest in New England. Water Resour. Res. Cent., Univ. N.H., Res. Rep. 15, 23 p.

282. Krause, C. R., and K. F. Jensen.
1978. Microtopographical changes in hybrid poplar leaves associated with air pollution exposure. Scanning Electron Microsc. 2: 738, 755-757.

283. Krawczyszyn, J.
1977. Cambial domain pattern in the root and root collar of Platanus. Acta Soc. Bot. Pol. 46: 531-541.

Domains in Platanus roots migrate upward, producing interlocked grain similar to that in the stem. In the root collar region, however, the patterns become quite dynamic and the grain may remain straight in spite of great rebuilding activity among the cambial initial cells. Roots may influence stem domain patterns thus wood grain patterns in the bole.

284. Krawczyszyn, J.
1977. The transition from nonstoried to storied cambium in Fraxinus excelsior. I. The occurrence of radial anticlinal divisions. Can. J. Bot. 55: 3034-3041.

Anticlinal divisions in typical Fraxinus wood were classified on the basis of length of the anticlinal partition relative to the length of the dividing cell. Partitions were found to be relatively shorter in longer cells and vice versa. Thus short cells tended to divide radially and longer ones to divide

obliquely. Fraxinus is intermediate between the two basic type of cambium, storied and non-storied, and wood qualities might be altered by early cultural conditions that favor shifting the cambial type toward one or the other.

285. Lamson, N. I.
1978. Fertilization increases growth of sawlog-size yellow-poplar and red oak in West Virginia. U.S. Dep. Agric. For. Serv. Res. Pap. NE-403. 6 p., illus.

Sawlog-size even-aged hardwood stands in north-central West Virginia were fertilized with N, P, and K, singly and in combinations. Applications of N alone produced the largest increases in annual basal area growth of yellow-poplar, while P alone produced the largest increases in red oak. NP did not stimulate the growth of yellow-poplar more than did N alone and did not increase the growth of red oak more than did P alone. N increased the 7-year basal area growth of yellow-poplar 34 percent, and could be expected to increase the 7-year volume growth of pure stands of sawlog-size yellow-poplar by about 30 percent in this region.

286. Lamson, Neil I., and H. Clay Smith.
1978. Response to crop-tree release: sugar maple, red oak, black cherry, and yellow-poplar saplings in a 9-year-old stand. U.S. Dep. Agric. For. Serv. Res. Pap. NE-394. 8 p.

Crop trees were released in an Appalachian hardwood stand (site index 70 for northern red oak) that had been clearcut 9 years earlier. We released 134 yellow-poplar, red oak, black cherry, and sugar maple stems of seedling origin to a 5-foot radius around the bole of each study tree; 140 comparable stems were not released. These trees were dominant, codominant, or intermediate, and all treated trees were released to a dominant crown position. On the basis of results 5 years after treatment, we do not recommend releasing such trees by the methods used in this study.

287. Lancaster, Kenneth F., and William B. Leak.
1978. A silvicultural guide for white pine in the northeast. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-41. 13 p., illus.

This practical guide for managing eastern white pine points out special measures required to regenerate and to grow white pine. Treatments are prescribed for seedling and sapling, poletimber, and sawtimber stands. The effects of soil-site relationships are considered in preparing stand prescriptions.

288. Lanier, Gerald N., and Brian W. Burns.
1978. Barometric flux. Effects on the responsiveness of bark beetles to aggregation attractants. J. Chem. Ecol. 4: 139-147.

289. Lanier, G. N., W. E. Gore, G. T. Pearce, J. W. Peacock, and R. M. Silverstein.
1977. Response of the European elm bark beetle, Scolytus multistriatus (Coleoptera: Scolytidae) to isomers and components of its pheromone. J. Chem. Ecol. 3: 1-8.

The aggregation pheromone of the European elm bark beetle, Scolytus multistriatus, consists of 3 compounds: (-)-4-methyl--3-heptanol (I), (-)-α-multistriatin (II), and (-)-α-cubebene (III). Field tests demonstrated that a mixture of synthetic I and II plus III obtained from cubeb oil is attractive to both sexes of the beetle. Further laboratory and field tests have now determined the relative attractiveness of I, II, and III, their isomers, and various combinations of these compounds. Individually and in pairs the components are only slightly attractive; I + II is clearly the most active doublet. Indirect evidence indicates that only one of the four enantiomers of I is active. Of the 4 isomers of II, only α is active. These findings have an important bearing on the development of attractive baits for use in beetle suppression experiments.

identify new market prospects and suggest marketing strategies. Across all regions of the country, heads of households under 30 report the most favorable images of camping. The best marketing prospects for major census regions are identified. And the need for reinforcement of specific image elements, such as "safe", "uncrowded", and "clean", are described for each of three major market segments - active campers, temporarily inactive campers, and prospective campers.

295. Lautenschlager, R. A., C. H. Kircher, and J. D. Podgwaite.
1977. Effect of nucleopolyhedrosis virus on selected mammalian predators of the gypsy moth. U.S. Dep. Agric. For. Serv. Res. Pap. NE-377. 6 p.

Nucleopolyhedrosis virus (NPV) of the gypsy moth was fed to three mammalian predators of the insect; the white-footed mouse, the short-tailed shrew, and the Virginia opossum. Analyses of general body condition, weight and reproductive efficiency, as well as necropsy and microscopic examination of tissues, indicated that the ingestion of NPV had no short-term effect on these animals.

296. Lautenschlager, R. A., and J. D. Podgwaite.
1977. Passage of infectious nuclear polyhedrosis virus through the alimentary tracts of two small mammal predators of the gypsy moth, Lymantria dispar L. Environ. Entomol. 6:737-738.

297. Lautenschlager, R. A., H. Rothenbacher, and J. D. Podgwaite.
1978. Response of small mammals to aerial applications of the nucleopolyhedrosis virus of the gypsy moth, Lymantria dispar. Environ. Entomol. 7:676-684.

Resident populations of white-footed mice, red-backed voles, opossums, chipmunks, and raccoons were evaluated

to detect short-term effects from aerial applications of the nucleopolyhedrosis virus (NPV) of the gypsy moth. NPV in 2 formulations was sprayed on woodland plots in central Pennsylvania at the rate of 2.5×10^{12} polyhedral inclusion bodies (PIB)/ha. Comparisons of prespray and postspray censuses of white-footed mice and red-backed voles in control and treated plots revealed no changes in populations or body weight that could be attributed to NPV treatments. Data from 47 caged and 250 free-living mammals showed no significant differences in organ and tissue weights, hematological values or necropsy and histopathological rankings between control and treated mammals when sample sizes were large and mean total weight between groups similar.

298. Leak, W. B.
1977. Relationship of species and site index to habitat in the White Mountains of New Hampshire. U.S. Dep. Agric. For. Serv. Res. Pap. NE-397, 9 p.

299. Leak, William B.
1977. Review of Systems analysis IV. Ecology 58: 703-704.

A brief review of Systems Analysis and Simulation in Ecology, Volume IV, edited by Bernard C. Patten.

300. Leak. W. B.
1978. Relationship of species and site index to habitat in the White Mountains of New Hampshire. U.S. Dep. Agric. For. Serv. Res. Pap. NE-397. 9 p. illus.

Beech/sugar maple/yellow birch characterize successional stands on the fine tills and the enriched or cove sites. Washed fine till and coarse till are dominated during succession by beech and birch with some red maple. Red maple is abundant on sandy sediments, silty sediments, and dry compact till. Softwoods characterize successional stands on habitats with poor drainage, shallow rock, outwash, and wet compact till. Previous research

shows that coarse till, fine till, and enriched sites are the only habitats where pure hardwoods are the climax vegetation. Site index generally averages highest on habitats where hardwoods predominate.

301. Leak, William B.
1978. Relationships of forest vegetation to habitat on two types of glacial drift in New Hampshire. U.S. Dep. Agric. For. Serv. Res. Note NE-257. 5 p., illus.

Species composition and site index were determined on nine tree habitats in an area of schistose drift and compared with previous findings on habitats with granitic drift. Habitats on schistose drift supported more sugar maple and had somewhat higher site indexes. Compact tills in schistose drift supported northern hardwoods, and the site indexes for yellow birch were 66 to 71 feet. Compact tills in granitic drift supported softwood-hardwood mixtures and had a softwood climax; the site indexes for yellow birch were 56 to 57 feet. Species composition and site index for a given habitat may vary between glacial drifts with different mineralogies.

302. Leak, W. B., and S. M. Filip.
1977. Thirty-eight years of group selection in New England northern hardwoods. J. For. 75: 641-643, illus.

A 38-year period of group selection in northern hardwoods is resulting in a permanent composition of one-quarter to one-third intermediate and intolerant species. The diameter distribution follows the inverse J-shaped form that typifies uneven-aged stands. Uneven-age management based on a combination of group and single-tree selection appears to be silviculturally sound.

303. Leak, William B., and Stanley M. Filip.
1977. Uneven-aged management of northern hardwoods in New England. U.S. Dep. Agric, For. Serv. Inf. Leafl. NE-35. 8 p.

This brochure provides an introduction to uneven-age management for general audiences and practitioners. It describes (1) harvest-cutting methods including single-tree selection, group selection, and modifications; (2) growth and yield; and (3) logging methods and precautions.

304. Leonard, R. E.
1976. Design capacity: a possible approach to some backcountry management problems. Appalachia 42(2): 20-21.

Forest managers are concerned about the resource degradation occurring at backcountry recreation sites and would like to know what use levels a site can sustain without irreversible damage. A "design capacity" approach offers managers a system to help them determine optimum use levels. A site's capacity would depend on its physical condition, the social density expected by visitors, and the available site maintenance money. A spectrum of sites managed for different use levels should be provided.

305. Leonard, R. E., and S. C. Fay.
1978. A compost bin for handling privy wastes: its fabrication and use. U.S. Dep. Agric. For. Serv. Res. Note NE-254. 6 p., illus.

A 24-ft^3 (6.8-m^3) fiberglass bin was constructed and tested for its effectiveness in composting privy wastes. A mixture of ground hardwood bark and raw sewage was used for composting. Temperatures in excess of 60°C for 36 hours were produced in the bin by aerobic, thermophilic composting. This temperature is sufficient to destroy most pathogenic microorganisms. Composting in a leak-proof bin seems a safe, practical, and economical method of handling privy wastes.

306. Leonard, R. E., H. J. Plumley, and W. R. Holman.
1977. A design capacity system. In: Proc. Natl. Trails Symp., Lake Junaluska, N.C. Sep. 8-10. p. 160-163.

307. Leonard, R. E., and A. M. Whitney.
1977. Trail transect: A method for documenting trail changes. U.S. Dep. Agric. For. Serv. Res. Pap. NE-389. 8 p., illus.

A trail transect system that documents trail conditions and changes in trails has been used successfully over the past 3 years to measure soil loss and changes in trail width and vegetation. The system also can be used to study the relationship between trail degradation and the physical characteristics of a site. Data from trail transects can be useful in determining the physical conditions favorable for trail construction.

308. Lewis, F. B.
1978. Mixing and applying microbials. Proc. Workshop on Aerial Application of Insecticides Against Forest Defoliators. Columbus, Ohio. p. 25-29.

309. Lewis, F. B., and W. D. Rollinson.
1978. Effect of storage on the virulence of gypsy moth nucleopolyhedrosis inclusion bodies. J. Econ. Entomol. 71: 719-722, illus.

Nucleopolyhedrosis inclusion bodies of Lymantria dispar L. were stored as powders and as water suspensions under different conditions and for different lengths of time. PIB's were subjected to room and elevated temperatures, and to refrigeration and freezing. Suspensions retained their potency for 5 yr under refrigeration, and for 2 yr at room temperature. Air-dried powder at 4°C lasted for 1 yr before losing potency slowly. Air-dried powder and suspensions held at 38°C for 6 mo lost potency.

310. Likens, Gene E., F. Herbert Bormann, John S. Eaton, Robert S. Pierce, Noye M. Johnson.
1977. Hydrogen ion input to the Hubbard Brook Experimental Forest, New Hampshire, during the last decade. Water, Air, and Soil Pollut. 6: 435-445. (Reprinted from Gen. Tech. Rep. NE-23, 1976.)

311. Likens, G. E., F. H. Bormann, R. S. Pierce, W. A. Reiners.
1978. Recovery of a deforested ecosystem. Science 199(3): 492-496.

The well-known devegetated watershed on the Hubbard Brook Experimental Forest has been regrowing for more than 7 years. This paper discusses total nutrient losses and recovery of vegetation on both this watershed and a commercially clearcut watershed. Inability to quantify nitrogen fixation rates prevents prediction of nitrogen availability over a rotation. However, clearcutting over long rotations appears to be ecologically acceptable in the northeastern United States.

312. Likens, G. E., F. H. Bormann, R. S. Pierce, J. S. Eaton, and N. M. Johnson.
1977. Biogeochemistry of a forested ecosystem. Springer-Verlag New York, Inc. 146 p.

This book presents an in-depth analysis of the biogeochemistry of a northern hardwood forest ecosystem. It includes long-term data on precipitation and stream water quantity and chemistry. Annual, seasonal, and monthly variations in input-output budgets for many nutrient elements are given as well as nutrient cycles for calcium and sulfur--the two permanent ions. Comparisons are made between the ecosystem at Hubbard Brook and other forested ecosystems in the world.

313. Likens, G. E., and R. S. Pierce.
1976. Effects on aquatic systems. In Workshop Report on Acid Precipitation and the Forest Ecosystem. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-26. p. 8-10.

This report highlights the problems of acid precipitation on aquatic systems, as noted in the Symposium on Acid Precipitation and the Forest Ecosystem, and recommends four major research areas for future work to fill the present gaps. These include establishing permanent precipitation and stream monitoring networks, conducting comprehensive ecosystem studies, and use of experimental watersheds and lakes and streams.

314. Lima, W. P., J. H. Patric, and N. Holowaychuk.
1978. Natural reforestation reclaims a watershed: A case history from West Virginia. U.S. Dep. Agric. For. Serv. Res. Pap. NE-392. 7 p.

Thirteen years of hydrologic data from two contiguous small watersheds in West Virginia were analyzed to determine the effects on streamflow of natural reforestation on abandoned farmlands. From 1958 to 1970, streamflow on the watersheds was unchanged. The history of land use on the study area helps explain the apparent lack of hydrologic effects of reforestation. Long-term observation suggests that soil and water were protected adequately when the land became completely revegetated with any plant cover.

315. Linton, David.
1977. The battle of Whiskey Run. Parks & Recreation 12(9): 64-67, 92, 94., illus.

Streams are "recreational facilities," too. Saving one in a valuable strip of open space in one Pennsylvania community required petitions, bumper stickers, sympathetic media coverage, and a lot of work. But when the red tape had settled, the open space was preserved and the environment, politics, and people of the community had changed in the process.

316. Little, Silas.
1978. Fire effects in the New Jersey Pine Barrens. Frontiers 42(2): 29-32.

Fire effects in the Pine Barrens are modified by several factors: succession, differences in susceptibility among species and tree sizes, tree age, differences in heat among fires or parts of a fire, and frequency of fires. Differences in fire history are largely responsible for the great differences in forest composition--not only among the trees, but also among the non-arborescent plants.

317. Little, S., and I. F. Trew.
1976. Breeding and testing pitch X loblolly pine hybrids for the Northeast. Northeast. For. Tree Improv. Conf. Proc. 23: 71-85.

In 1964 the Northeastern Forest Experiment Station, in cooperation with Westvaco and many other organizations and individuals, established a breeding orchard of selected pitch and loblolly pine clones. Controlled pollinations were made between clones in 1968-74. Test plantings of 1-0 seedlings have been made in eight states. Initial results show that certain hybrids have good form, grow about as rapidly as loblolly pine and faster than pitch pine, and are hardy in some sections outside of loblolly pine's natural range.

318. Little, S., and I. F. Trew.
1977. Progress report on testing pitch X loblolly pine hybrids and on providing hybrid seed for mass plantings. Northeast. For. Tree Improv. Conf. Proc. 24: 14-28.

Recent test plantings of hybrids between selected clones of pitch and loblolly pines are briefly described, and results from some of the 1971-74 test plantings are discussed. Not only do certain hybrids combine loblolly pine's rate of growth and form with pitch pine's winter-hardiness, but their fibrous root systems apparently permit rapid growth on droughty sites or strip-mined areas. Hybrids in the early test plantings have so attracted the attention of practicing foresters that there is a demand for stock for mass plantings. This has forced decisions on procedures for supplying needed seed; the procedures, plans, and action are briefly described.

319. Lockmann, Ronald F.
1977. Man-made New Orleans: Some interactions between the physical and esthetic environments. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 355-367.

The relations between the physical environment and esthetic dimensions of the New Orleans cultural landscape are examined. The esthetic characterictics associated with New Orleans urban morphology are examined with respect to possible constraints by the physical environment. Salient townscape features such as street grid system, surface-drainage network, and

spatial features of selected residential neighborhoods provide instances that demonstrate the varying levels of physical environmental impingement upon the esthetic landscape.

320. Lynch. J. A., and E. S. Corbett.
1976. Implications of land management practices on water resources and the aquatic environment. Trans. Northeast. Soc. Conserv. Eng. p. 1-37.

Forest management practices are conducted on a variety of watersheds which include streams and impoundments of all sizes. In many cases headwater streams with fragile aquatic ecosystems are impacted. This paper discusses the physical and chemical basis of these impacts and associated management implications.

321. Lynch, J. A., E. S. Corbett, and R. Hoopes.
1977. Implications of forest management practices on the aquatic environment. Fisheries 2(2): 16-22.

Existing information was used to formulate the probable effects of timber harvesting on fisheries. These probable effects are evaluated on the basis that each species of fish has a particular set of environmental conditions and habitat preferences that are optimal for its maintenance. The effects of timber harvesting on the aquatic environment are analyzed in terms of (1) water temperature, (2) turbidity and sedimentation, (3) dissolved nutrients, (4) allochthonous organic detritus, and (5) streamflow.

322. Lynch, James A., James H. Patric, and Gerald M. Aubertin.
1977. Forests and water quantity. In Water resources at the forest urban interface, J. A. Lynch, and E. S. Corbett, eds. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Res. PA-2. p. 8-11.

Evaporative loss from forests can be managed crudely; usually it is reduced by timber harvest, and water

quantity (i.e., streamflow) is increased accordingly. The effects of other forest treatments such as type conversion, herbiciding, and reforestation are considered. It is concluded that present environmental concern precludes large-scale effort to increase water quantity by any of these treatments. Subjects for further research are suggested.

323. Lynch, J. A., W. E. Sopper, and E. S. Corbett.
1977. Timber harvesting and herbicide usage changed streamwater nutrients. Sci. in Agric., Pa. State Univ. 24(3): 8-9.

Clearcutting the lower 45 percent of a hardwood watershed in central Pennsylvania did not alter significantly the quality of water flowing from the watershed. However, when herbicides were applied to control regrowth of woody and herbaceous vegetation, significant changes in nutrient concentrations of streamwater were observed. Data are presented for calcium, magnesium, potassium, sodium, and nitrate-nitrogen.

324. Lynch, G. Robert, F. Daniel Vogt, and Harvey R. Smith.
1978. Seasonal study of spontaneous daily torpor in the white-footed mouse, Peromyscus leucopus. Physiol. Zool. 51: 289-299.

325. Lyon, Richard H., Christopher N. Blair, and Richard C. DeJong.
1977. Evaluating effects of vegetation on the acoustical environment by physical scale-modeling. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25: 218-225.

It is generally assumed that vegetation is beneficial acoustically, as well as esthetically, in that it may act as a shield to reduce highway noise impact on a community as in a sound absorber to reduce reverberant noise levels in city streets. Contradictory evidence exists, however, that noise may be increased because of vegetation. We performed field studies and laboratory scale-model experiments to study interaction

between sound-scattering by trees and shadowing by barriers. The studies indicate that, while barrier effectiveness may be reduced by addition of trees, propagation through a stand of trees may provide small noise reductions.

326. McCay, Roger E.
1978. Hiker preferences for trail features and maps. U.S. Dep. Agric. For. Serv. Res. Note NE-262. 4 p., illus.

Hikers at a Pennsylvania state park were asked what items were essential to their trail experience. From a list of 18 items, an overwhelming majority of hikers wanted to see trail names and directional signs along a natural-surfaced trail.

327. McCay, Roger E.
1978. Don't be a recreational slob. Pa. For. 68(3): 447-448.

Of about 200 landowners in Pike County, Pa., who were queried, more than half posted their land to keep out hunters, but other recreationists were also barred. Owners said recreationists trespass, tear down fences, litter, block driveways, leave gates open, shoot too close to buildings, don't compensate or even thank landowners, kill too much game, and overrun property. The author suggests ways recreationists could make themselves more welcome.

328. McGinnes, E. A., J. E. Phelps, P. S. Szopa, and A. L. Shigo.
1977. Wood anatomy after tree injury: A pictorial study. Res. Bull. 1025. Univ. Mo., Columbia. 35 p.

329. McLain, Thomas E., and George E. Stern.
1978. Withdrawal resistance of pallet nails and staples in five western woods. Va. Polytech. Inst. and State Univ., Wood Res. and Wood Constr. Lab., William H. Sardo, Jr. Pallet and Container Res. Lab. Bull. 155. 12 p., illus.

The delayed nail and staple withdrawal resistance was examined on the basis of 180 tests on pointless, helically threaded, hardened-steel, 3-inch by 0.120-inch pallet nails with umbrells heads; and 2-1/2-inch, 15-gauge, 7/16-inch crown, plastic-coated, pallet staples in pallet stock of five western species (Fremont cottonwood, California white and black oak, Oregon white oak, and coast-type Douglas fir.) The fastener effectiveness in these species was compared with that in other wood species.

330. McManus, M. L.
1976. Weather influences on insect populations. In Proc. 4th Natl. Conf. Fire and For. Meteorol. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. RM-32. p. 94-100.

Weather influences forest insect populations in many ways, some more obvious than others. The indirect effect of weather operating through the host plant may be more critical to the survival of individuals than the direct effect of specific components of weather. Examples are presented that demonstrate how weather affects forest insect populations and various approaches are discussed.

331. McManus, Michael L.
1978. Expanded gypsy moth research and development program. J. For. 76: 144-149, illus.

Since it was introduced into New England in 1869, the gypsy moth, Lymantria dispar L., has slowly spread through the oak-hickory forests to the south and west and continues to be the most serious forest insect problem in the East. Work on the moth was increased substantially in 1971 to cope with a region-wide outbreak in the Northeast, and in 1975 it was accelerated through the USDA Combined Forest Pest Research and Development Program. New technology from the program is being incorporated into an integrated system for managing this insect.

332. McTaggart-Cowan, J. D., and J. W. S. Young.
1977. Surface air temperature in a maritime metropolitan region. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 88-93.

In investigations of the micrometeorology of any area, one of the basic parameters required is the spatial and temporal distribution of the surface air temperature. A mobile instrument mounted on an automobile was used for measuring temperatures within the surface mixed layer. Details are presented of a case study at Saint John, New Brunswick, in summer. The effects of topography, lakes, sea-breezes, and land-use are discussed.

333. Mader, D. L., H. W. Lull, and E. I. Swenson.
1977. Humus accumulation in hardwood stands in the Northeast. Bull. 648. Mass. Agric. Exp. Stn., Amherst, and Northeast. For. Exp. Stn. 37 p.

Humus layers were sampled in six regions in the Northeast according to stand class and soil drainage class, a total of 209 plots. The average depth, weight, organic matter content, and moisture-holding capacity of the layers are presented by regions, stand class, soil drainage class, and overall average. The relationships of humus accumulation to drainage class, dbh, height, age, basal area, site index, plot position, elevation, slope, and aspect were investigated by simple and multiple regression analyses. Age and drainage class were important determinants of amount and type of humus accumulation. Hydrologic importance of the humus layers is evaluated.

334. Marchand, Peter J.
1977. Subalpine bogs of the Mahoosuc Range, Maine: Physical characteristics and vegetation development. Cent. North. Stud., Wolcutt, Vt. 19 p.

335. Marquis, David A.
1977. The role of tree improvement in the Northeast: A silviculturist's point of view. Northeast. For. Tree Improv. Conf. Proc. 25: 48-57.

The role of tree improvement in the Northeast is likely to be quite different from that in other parts of the country, because artificial regeneration is not widely used on the commercial forest lands of this region. The best opportunities for traditional planting and improvement programs seem to be in using coniferous species such as eastern white pine for the reforestation of open or poorly stocked lands, or forestation of open or poorly stocked lands, or for conversion from poor-quality hardwoods on appropriate sites. In the mixed hardwood stands that predominate throughout the Northeast, the widespread use of artificial regeneration and tree improvement will probably include mixtures of natural and artificial regeneration in the same stand. Imaginative and coordinated efforts by geneticists and silviculturists will be required to make such a culture feasible.

336. Marquis, David A.
1977. Impact of deer on Allegheny hardwood regeneration. In: A seminar on the problem of deer and forest regeneration: papers presented at 1977 summer meeting, Plateau and Northern Hardwood Chapter, Soc. Am. For., Ridgway, Pa. p. 28.

337. Marquis, David A.
1977. Devices to protect seedlings from deer browsing. U.S. Dep. Agric. For. Serv. Res. Note NE-243. 7 p., illus.

Studies on the Allegheny Plateau of Pennsylvania have shown that several types of wire or plastic tubes can be erected around tree seedlings to protect them from deer browsing. The two most promising devices are a 4- to 6-inch diameter plastic tube with small mesh and a 12-inch diameter tube constructed of chicken wire. Both types need to be at least 5 feet tall to provide adequate protection in areas of heavy browsing

pressure. The plastic protectors are more expensive than those made of wire, but take somewhat less time to make, and offer added protection from rodents.

338. Marquis, D. A.
1977. Application of uneven-aged silviculture and management on public and private lands. Proc. In-Service Workshop on Uneven-aged Silviculture and Management in the Western United States, Redding, Calif. 1976. p. 20-54.

Guidelines for application of uneven-aged silviculture are scattered and fragmented. Information on choice of cutting method, regulation of yield, marking, allowable cut projections, road layout, and control of residual tree damage are summarized in this paper.

339. Martin, Frank P., and Grace L. Powell.
1977. The urban heat island in Akron, Ohio. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 94-97.

Data gathered by automobile traverse were used to describe the urban heat of Akron, Ohio. Observations were made at 2100 or 2200 EST on four nights--17 April, 11 July, 10 October, and 2 January. Weather conditions not conducive to heat-island development were avoided. Temperatures in the center of the heat island were 6 to 14° warmer than rural areas outside the city. The heat-island center was always over a mixed residential/commercial area. Topographic influences were apparent in the heat-island pattern.

340. Martin, A. Jeff.
1977. A computer program for analyzing PERT networks. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-32. 10 p., illus.

A computer program designed to analyze PERT networks is described. Use of the program is illustrated with an example of a National Forest timber sale. A source listing of the program, input instructions, output from the example, and an explanation of the output tables are included.

341. Martin, A. Jeff.
1977. Increased yields from near-complete multi-product harvesting of a cove hardwood stand. North. Logger 26(4): 6-7, 37.

A 1.7-acre yellow-poplar/red maple stand in southwest Virginia was cruised and the timber harvested for sawlogs and whole-tree chips. Cruise data were used to estimate yields from four other roundwood harvesting options. The actual yield from near-complete harvesting exceeded the estimated yields from the four roundwood options by 27 to 104 percent.

342. Martin, C. Wayne.
1977. Distribution of tree species in an undisturbed northern hardwood-spruce-fir forest, the Bowl, N.H. U.S. Dep. Agric. For. Serv. Res. Note NE-244. 6 p., illus.

Knowledge acquired from forests that have never been logged can provide clues to the long-term effects of resource utilization. In 1974, a survey was made of the vegetation of the Bowl Research Natural Area in central New Hampshire, known to be undisturbed by humans; and an adjacent watershed known to have been logged in the late 1880's. There were no significant differences in the mean basal areas and aboveground biomass of trees between the two watersheds, indicating that 90 years after logging this forest has nearly recovered. The major species in the Bowl are yellow birch, beech, sugar maple, red spruce, and balsam fir. The forest has a mean basal area of 28 m^2/ha and contains about 260 metric tons of aboveground dry biomass. A nearby 60-year-old second growth forest contains about 23 m^2/ha basal area and only about 140 t/ha.

343. Matlack, Martin C., and Daniel T. Jennings.
1977. Cohabitation of female spiders guarding egg sacs. J. Kans. Entomol. Soc. 50: 519-522.

344. Mazzone, H. M., and G. H. Tignor.
1976. Insect viruses: Serological relationships. In Advances in Virus Research 20: 237-270.

The subject of this review is the serological characterization of insect pathogenic viruses from the following five pathogenic and morphologic groups: nucleopolyhedrosis viruses, granulosis viruses, cytoplasmic polyhedrosis viruses, pox-like viruses and the nonoccluded group that includes the iridescent viruses. The subject matter discussed includes terminology, techniques, immunofluorescence and pathogenesis, antigenic characterization and serologic relationships, serology in adaption, latency, and synergism, reactions between viral components and host material, insect viruses as biological control agents: serologic aspects, and the use of computers in insect virus serology.

345. Meadows, J. C., Jr., and A. T. Schuler.
1977. Nonlinear programing and the decreasing marginal utility problem: A goal programing framework for decision. Inst. Manage. Sci. Proc. 1976: 307-314.

Previously used goal programing approaches to multiple-use-management decision-making incur two serious drawbacks: they do not tackle the decreasing marginal utility problem; and the preemptive weights are too strong an assumption. This paper describes a theoretical attempt to solve these problems via nonlinear goal programing methods.

346. Melhuish, John H., Jr.
1977. Total fatty acid profiles of several closely related fungi. (Abstr.) Proc. 3rd North Am. Conf. on Mycorrhizae. Athens, Ga. 1977. p. 93.

347. Mendel, Joseph J., and Margaret K. Peirsol.
1977. Quality index tables for some eastern hardwood species based on lumber prices from 1970 to 1974. U.S. Dep. Agric. For. Serv. Res. Pap. NE-370. 10 p.

Revised quality index (QI) tables for white ash, beech, black cherry, birch, hard maple, soft maple, red oak, white oak, and yellow-poplar are based on 1970-74 lumber prices for the Appalachian and northeastern marketing areas. Changes in QI since 1964-68 were greatest for white oak; there also were significant changes in QI for red oak, white ash, and yellow-poplar.

348. Merrow, Susan B., Robert Clarke, and Paul E. Sendak.
1977. How does it taste? Natl. Maple Syrup Dig. 16(3): 11-13.

349. Meyerson, Norman L.
1977. Study of traffic noise levels at various heights of a 39-story building. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 195-201.

Comparative measurements of exterior noise levels made at floors 3, 14, 26, and 37 of a high-rise apartment tower, when presented as a statistical distribution of percent exceedance vs. decibels, show the nature of the influence of local traffic at the low floors compared to the influence of an area source at the high floors. The open window penalty to interior noise levels was measured as well as the side street noise propagation along the building from avenue vehicular traffic sources alone.

350. Michalski, L.
1976. Effects of ionizing radiation on changes in the level of gibberellin-like substances during Scotch pine seed germination. Acta. Soc. Bot. Polon. 45: 263-269.

Gamma-irradiated pine seeds have a higher ratio of free to bound gibberellins than do controls. Exposure of seeds to 1.0 kR of gamma irradiation for 24 hours increases the level of free gibberellins whereas the level of bound gibberellins decreases. Perhaps ionizing radiation releases bound gibberellins that may influence later growth.

351. Miller, D. R.
1977. UCONN Studies of plant-atmosphere relationships may lead to improved land use in Connecticut. Res. for Conn. 47. Storrs Agric. Exp. Stn., Storrs, Conn.

352. Miller, David R.
1977. Structure of the microclimate at a woodland/parking-lot interface. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 109-114.

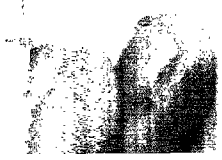
Radiation balances and vertical and horizontal profiles of air temperature, vapor pressure and wind speed were measured across the interface of a large asphalt parking lot and an 18-m-tall Quercus velutina forest. The partitioning of available energy over the adjacent areas shows steep gradients between the parking lot and forest microclimates. Horizontal temperature and humidity gradients across the interface were of the same order of magnitude as the vertical gradients above the respective surfaces.

353. Miller, D. R., and C. A. Federer
1976. Sap velocity, atmospheric demand, and transpiration in paper birch and white oak saplings. (Abstr.) Bull. Am. Meteorol. Soc. 57: 1407.

354. Miller, Robert W., Robert S. Bond, and Brian R. Payne.
1978. Land and timber values in an urban region. J. For. 76: 165-166.

355. Miller-Jones, D. N., D. R. Houston, and T. F. Preece.
1977. The use of electrical resistance measurements to detect watermark disease of cricket bat willow. Plant Dis. Rep. 61: 268-272.

One of the symptons of watermark disease of cricket bat willow, Salix alba var. caerulea, caused by the bacterium Erwinia salicin, is a physical weakening and discoloration of the wood, rendering it useless



for cricket bat manufacture. Diseased trees, which must be destroyed by burning, often escape detection until they are harvested. Watermark-discolored tissues were readily distinguishable from healthy xylem, and from tissues discolored from other causes, by their low resistance to a pulsed electric current. Disease was detected in trees and propagating shoots with no apparent external symptoms.

356. Millner, James D.
1977. Credit for maple producers. Natl. Maple Syrup Dig. 16(3): 17-23.

General procedure and required information for applying for a loan for a maple syrup business are presented. Four sources of credit are discussed--commercial banks, Farmers Home Administration, Farm Credit Service, and Small Business Administration.

357. Mitchell, Thomas R., and David P. Worley.
1976. Land taxation changes affect woodland management objectives. Ohio Woodlands 14(4): 6-7.

Property taxes alone can equal or exceed net future values expected from growing timber from bare land. Hence they discourage both ownership and management for timber production per se. Either owners must recognize multiple benefits from forest-land or taxing arrangements that encourage timber production must be enacted.

358. Moeller, George H.
1977. The Pinchot Institute: Toward managing our urban forest resources. J. Arboric. 3(10): 181-186.

In 1971, the Forest Service established the Pinchot Institute of Environmental Forestry Research to deal with forest-related environmental concerns in urban areas. The Institute is named in honor of the first Chief of the Forest Service, one of America's foremost early conservationists. Within the Pinchot Institute, the Forest Service and nine northeastern universities

have joined together to form the Consortium for Environmental Forestry Studies. Through this program, scientists at institutions throughout the Northeast are developing information needed to solve problems of policy formulation, regional planning, and management of urban forest resources. Though the research is done in the Northeast, much of it is applicable to management of urban forests throughout the Nation and abroad. By coordinating Forest Service research with that of other Consortium members, the Institute seeks to determine how trees and forests can best serve the needs of urban man.

359. Moeller, George H.
1977. The Pinchot Institute--A program for urban forestry research. In Proc. Tree Wardens, Arborists Util. Conf. p. 87-94.

At the outset of environmental consciousness in the Seventies, the Forest Service established a special research institute to deal with forest-related environmental concerns in urban areas. It is named the Pinchot Institute of Environmental Forestry Research, in honor of the first Chief of the Forest Service; one of America's foremost early conservationists. Within the Pinchot Institute, the Forest Service and nine northeastern universities have joined together to form the Consortium for Environmental Forestry Studies. Through this program, scientists are developing the information needed to solve problems of policy formulation, regional planning, and management of urban forest resources. The Forest Service's own research and the research of other Consortium members is coordinated to meet the Institute's overall objective--to determine how trees and forests can best serve the needs of urban man.

360. Moeller, George H.
1977. Research priorities in environmental education. In Children, Nature, and the Urban Environment: Proc. Symp. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-30. p. 219-222, illus.

Although natural processes operate in urban areas, they are difficult to observe. Much discussion during the

symposium-fair was devoted to finding ways to improve urban children's environmental understanding through environmental education programs. But before effective environmental education programs can be developed, research is needed to: test the effectiveness of various approaches to teaching environmental education in relation to differences among children; help define testable program goals that relate to a child's level of comprehension; develop better methods of training teachers and administering environmental education programs; and identify ways to use elements found in the urban environment to foster an understanding of environmental concepts.

361. Moeller, G., and T. More.
1976. Future demands of urban residents for U.S. National Parks and Forests. In Trees and Forests for Human Settlements: Proc. XVIth IUFRO World Congr. Toronto, Canada. Centre for Urban Forestry Studies, Univ. Toronto. p. 93-106.

362. Moeller, George H., Elwood L. Shafer, and Russell L. Getty.
1977. Leisure environments of tomorrow. In Outdoor recreation: Advances in application of economics. Proc. Natl. Symp. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. WO-2: 22-34, illus.

As an aid to policy and decisionmaking about future environmental problems, a panel of experts was asked to predict the probabilities of future events associated with natural resource management, wildland-recreation management, environmental pollution, population-workforce-leisure, and urban environment. Though some of the predictions projected to the year 2050 may sound fantastic now, the authors think that some of the events predicted may occur even sooner than forecast.

363. Montgomery, Michael E., and Lowell R. Nault.
1977. Comparative response of aphids to the alarm pheromone, (E)-β-farnesene. Entomol. Exp. & Appl. 22: 236-242.

364. Montgomery, Michael E., and Lowell R. Nault.
1977. Aphid alarm pheromones: Dispersion of Hyadaphis erysimi and Myzus persicae. Ann. Entomol. Soc. Am. 70: 669-672.

365. Montgomery, Michael E., and David G. Nielsen.
1978. Dips for control of black vine weevil larvae in pots. Insecticide and Acaricide Tests 3: 161.

366. More, Thomas A.
1977. An analysis of wildlife in children's stories. In Children, Nature, and the Urban Environment: Proc. Symp. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-30. p. 89-92.

Urban people encounter wildlife in various ways. One of the most important is the vicarious encounter with animals in children's stories. The surprising number of children's animal stories can be divided into three categories, each of which affects children's beliefs, attitudes, and preferences for wildlife. Because children's stories may have such a lasting effect, we need to consider the ways in which animals are portrayed in them.

367. More, Thomas A., Robert O. Brush, and J. Alan Wagar.
1977. Variation and recreation quality in river management. In Proc. River Recreation Manage. and Res. Symp. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-28. p. 329-333.

Variation in the river environment is a major determinant of the quality of river recreation experiences. In river canoeing, there are four main sources of variation: psychosocial variation, landscape variation, river variation, and variation inherent in the activity itself. By considering how these sources of variation interact, it should be possible to affect the quality of the recreation experience and accomplish other management objectives as well.

368. More, Thomas A., and Brian R. Payne.
1978. Affective responses to natural areas near cities. J. Leisure Res. 10(1): 7-12.

In an exploratory study of emotions in recreation, visitors to three Audubon nature centers in Massachusetts completed a questionnaire to measure their moods at the beginning and at the end of their on-site visits. Entering levels of negatively valued moods were quite low, and decreased significantly during the visit. Entering levels of positively valued moods were moderately high, but these also decreased slightly during the visit. The moods of the visitors appeared to be unrelated to background characteristics. To account for these findings, a process emphasizing anticipation is postulated, and areas for future research are suggested.

369. Moss, Michael R.
1977. Sulfur pollution: An environmental study of Welland, Ontario. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 308-314.

The distribution of sulfur as an environmental pollutant is analyzed in the vicinity of Welland, Ontario. A biogeochemical-cycle approach enables areas of excess accumulation to be compared among all linked ecosystem components. Although the patterns of distribution are similar, the amounts of sulfur accumulated in different ecosystems, grassland and woodland, show marked contrasts. The significance of these findings to urban and rural land-use planning is considered.

370. Mott, D. G.
1976. The consequences of applying no control to epidemic spruce budworm in eastern spruce-fir. In Proc. Symp. Spruce Budworm. U.S. Dep. Agric. For. Serv. Misc. Publ. 1327: 67-72.

371. Murphy, C. E., Jr., T. R. Sinclair, and K. R. Knoerr.
1977. A model for estimating air-pollutant uptake by forests: Calculation of absorption of sulfur dioxide from dispersed sources. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 340-350.

The computer model presented in this paper is designed to estimate the uptake of air pollutants by forests. The model utilizes submodels to describe atmospheric diffusion immediately above and within the canopy, and into the sink areas within or on the trees. The program implementing the model is general and can be used with only minor changes for any gaseous pollutant. To illustrate the utility of the model, estimates are made of the sink strength of forests for sulfur dioxide. The results agree with experimentally derived estimates of sulfur dioxide uptake by crops and forest trees.

372. Myklestad, Erik, and J. Alan Wagar.
1977. PREVIEW: Computer assistance for visual management of forested landscapes. Landscape Plann. 4: 313-331.

The PREVIEW computer program facilities visual management of forested landscapes by generating perspective drawings that show proposed timber harvesting and regrowth throughout a rotation. Drawings show how changes would appear from selected viewing points and show landscapes as either a grid of distorted squares or by symbols representing trees, clearings, water, rock, etc. PREVIEW can also show roads and other linear features.

373. Nathan, K., G. H. Nieswand, E. S. Corbett, and J. R. Pawlow.
1976. Rainfall-runoff relationship of a small drainage area under suburban development. Am. Soc. Agric. Eng. Winter Meet., Chicago, Ill. Pap. No. 76-2542, 25 p.

A 10-year study of a small watershed showed a 41 percent increase in the peak flow of a 1-hour unit hydrograph, resulting from a 4.19 percent decrease in

natural vegetation. Runoff volume of a 10-year, 1-hour storm increased 36 percent with an increase in peak runoff rate of 70 percent.

374. Nault, L. R., and M. E. Montgomery.
1977. Aphid pheromones. In: Aphids as virus vectors. Academic Press, Inc., New York. Chap. 22.

375. Nielsen, David G., and Michael E. Montgomery.
1977. Toxicity and persistence of foliar insect sprays against black vine weevil adults. J. Econ. Entomol. 70(4): 510-512.

376. Nielsen, D. G., L. E. Terrell, and T. C. Weidensaul.
1977. Phytotoxicity of ozone and sulfur dioxide to laboratory fumigated Scotch pine. Plant Dis. Rep. 61: 699-703.

377. Nieswand, G. H., T. Shelton, T. Fusillo, and E. S. Corbett.
1976. A study of the impact of suburban development on water quality in a small watershed. Am. Soc. Agric. Eng. Winter Meet., Chicago, Ill. Pap. No. 76-2543, 18 p.

Preliminary results of a study of the impact of suburban development on water quality in a small watershed are presented. With approximately 35 percent of the watershed developed or under construction, some changes in baseflow water quality have been observed. Greater changes in water quality occurred between baseflow and stormflow conditions during the study period. Mean loadings of all observed water quality parameters were considerably higher during stormflows than during baseflows. Water quality changes during stormflows may be a more valid indication of the impact of development than baseflows.

378. Nishino, C., W. S. Bowers, M. E. Montgomery, L. R. Nault, and M. W. Nielson.
1977. Alarm pheromone of the spotted alfalfa aphid, Therioaphis maculata Buckton (Homoptera: Aphididae) J. Chem. Ecol. 3(3): 347-357.

379. Nolley, Jean W.
1977. Christmas trees: a bibliography. Am. Christmas Tree J. 21(2): 9-11.

1977 supplemental listing of published information on the Christmas tree industry.

380. Nolley, Jean W.
1978. Christmas trees: a bibliography (1978 Supplement) Am. Christmas Tree J. 22(1): 27-28.

381. Normand, Joelee.
1977. Techniques of data analysis and presentation for planners of the metropolitan environment. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 438-447.

Relationships between the characteristics of the physical environment of a metropolitan area and the acitivites of its human inhabitants can be used to predict probable future dynamic trends, both demographic and environmental. Using simple linear regression, we were able to highlight several dynamic features of the metropolitan area of Tulsa, Oklahoma. Computer movies of the growth of Tulsa and attendant air-pollution problems were used for showing demographic and physical features simultaneously to facilitate the information-assimilation process so critical to planning.

382. Northeastern Forest Experiment Station.
1977. How to prepare manuscripts for Station publication: A desk guide for authors and typists. U.S. Dep. Agric. For. Serv. Northeast. For. Exp. Stn. (unnumbered).

383. Northeastern Forest Experiment Station.
1977. Proceedings of the Conference on Metropolitan Physical Environment. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. 447 p.

384. Northeastern Forest Experiment Station.
1977. Proceedings of the Symposium on Intensive Culture of Northern Forest Types. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-29. 356 p.

A report on the symposium held in July 1976 at the University of Maine, Orono, containing 35 papers presented at the meeting.

385. Northeastern Forest Experiment Station.
1977. Children, nature, and the urban environment: Proceedings of a symposium-fair. U.S. Dep. Agric. For. Serv. Gen. Tech Rep. NE-30. 261 p., illus.

A report on the symposium-fair held 19-23 May, 1975 at the C. H. Marvin Center, the George Washington University, Washington, D.C., containing 33 papers. Sections are devoted to defining the role of natural environments, human development research on urban children and the natural environment, and community and institutional response to fostering desirable relationships between nature and development of urban children.

386. Northeastern Forest Experiment Station.
1977. 1976 at the Northeastern Forest Experiment Station. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-33. 40 p.

A summary report on highlights of research activities and accomplishments of the Experiment Station in 1976, including an annotated list of publications.

387. Nyland, Ralph D., Donald F. Behrend, Phillip J. Craul, and Herbert E. Echelberger.
1977. Effects of logging in northern hardwood forests. Tappi 60(6): 58-61.

Timber was harvested at three locations using individual tree selection, strip clearcutting, and patch clearcutting. Special practices did not significantly reduce injuries to residual trees. Logging reduced the distribution and density of regeneration. Skidding affected 16-18% of the soil surface within partial cuts and about twice that in clearcuts due to more minor disturbance. Erodibility appeared limited. Songbird numbers and diversity increased. Effects upon other animals were unclear. Time devoted to various jobs was similar between methods. Top-lopping and sapling felling reduced output significantly. Cutting method and top-lopping appeared less visually important than group affiliation, although lopped partial cuts were most preferred. Viewers disliked logging slash in all treatments. No method had significant detrimental effects upon the forest and associated resources.

388. Odell, Thomas M.
1978. Periodicity of eclosion and pre-mating behavior of gypsy moth. Ann. Entomol. Soc. Am. 71: 748-751, illus.

The eclosion and pre-mating behavior of 288 male and 450 female gypsy moth, Lymantria dispar (L.), adults were observed during July 22-29, 1972. Eclosion activity of both sexes was strictly diurnal; initial daily eclosion was synchronized with sunrise. The periodicity of peak eclosion differed from day to day, and appeared to be influenced by temperature variation; temperatures above 24° C apparently enhanced eclosion. The average time from eclosion to first flight in males was 3.56± 0.12 h. Nocturnal flight occurred at temperatures above 21° C.

389. Paproski, Dennis M., and Julian R. Walker.
1977. A first-approximation-urban-air-quality indicator. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 254-262.

Development of the first-approximation-urban-air-quality indicator was reported by the Economic Council of Canada. The indicator takes account of ambient

concentrations of five pollutants: sulfur dioxide, particulate matter, oxides of nitrogen, carbon monoxide, and total oxidants. Epidemiological evidence indicating the potential impact of these pollutants on human health is also reported. Values of the indicator are calculated for the years 1971-74 for a number of Canadian cities: the overall trend appears to be toward cleaner air, though concentrations of oxidants and nitrogen oxides have increased.

390. Parker, J.
1976. Effects of defoliation on levels of chlorogenic acid in oak bark. Plant Physiol. Suppl. 57: 64.

391. Parker, Johnson.
1978. Effects of fertilization on shoot growth of defoliated and undefoliated red oak seedlings. U.S. Dep. Agric. For. Serv. Res. Pap. NE-399. 3 p., illus.

Defoliated Quercus rubra seedlings treated with dry or liquid + dry fertilizer grew more than unfertilized, undefoliated seedlings.

392. Parker, Johnson.
1978. Free sugars and polyols in developing birch leaves. (Abstr.) Plant Physiol. Suppl. 61: 9.

393. Patric, James H.
1976. Effects of wood products harvest on forest soil and water resources with emphasis on clearcutting in moist climates. In The Scientific base for silviculture and management decisions in the National Forest System. U.S. Dep. Agric. For. Serv., Washington, D.C., p. 39-51.

The watershed management literature was reviewed to summarize effects of wood products harvest on forest soil and water resources. Effects on soil are minimal in eastern United States, largely a benefit of vigorous revegetation in humid climates. Slower and

lesser revegetation can accelerate erosion in arid western climates. Harvest always augments streamflow, with largest increases in most humid climates. The major effect on water quality is increased sediment loading accompanying accelerated soil erosion. Intelligently applied logging practices are the key to minimizing damage to soil and water.

394. Patric, James H.
1977. Soil erosion and its control in eastern woodlands. North. Logger 25(11): 4, 5, 22, 23, 31, 51, illus.

This paper, presented at a meeting of SCS woodland conservationists, reviews the evolution of concepts of soil erosion in eastern woodland over the past 40 years. Soil-water relations in the uncut and cut woodland are contrasted, with logging roads pinpointed as the most common cause of accelerated soil erosion. It is concluded that timber can be harvested professionally with little more than double the rates of soil erosion and stream sedimentation characteristic of the uncut forest, rates likely to persist no longer than a year or two after logging.

395. Patric, James H.
1978. Hydrology. In Yearbook of science and technology. McGraw-Hill Book Co., New York. p. 230-232.

396. Patric, J. H.
1978. Harvesting effects on soil and water in the eastern hardwood forest. South. J. Appl. For. 2: 66-73, illus.

Research on forest soil and water was summarized for eastern United States. Soil erosion remains close to geologic rates during responsibly conducted harvest of wood products but carelessly built logging roads can erode rapidly. Harvest increases water yields but has little influence on stormflow. Evidence to date suggests that harvest of stemwood seems unlikely to cause nutrient problems in soil or water.

397. Patric, J. H., and G. M. Aubertin.
1977. Long-term effects of repeated logging on an Appalachian stream. J. For. 75: 492-494, illus.

Watershed 2 on the Fernow Experimental Forest has been logged four times since the turn of the century. While little is known of how streams were affected by logging after 1901 or during World War II, the effects of diameter-limit cutting in 1958 and 1972 are well documented. Both cuts caused small increases in streamflow but had little effect on water quality by any criterion except turbidity, which was increased by poorly located and ill-managed logging roads. The evidence suggests that if responsible road practices are followed, continued diameter-limit cutting will not harm forest streams.

398. Patric, J. H., and L. K. Brink.
1977. Soil erosion and its control in the eastern forest. In Soil erosion: Prediction and control: Proc. Purdue Univ. Natl. Conf. on Soil Erosion. Special Publ. 21, Soil Conserv. Soc. Am. Ankeny, Iowa. p. 362-368.

This paper describes soil erosion in the undisturbed forest and how it is slightly accelerated by carefully regulated cutting. Logging roads are shown as the usual and major cause of severely accelerated erosion in the eastern forest. The Universal Soil Loss Equation is applicable for estimating erosion from logging roads in well-managed forest and from poorly managed woodland where the organic cover characteristic of forest soil has been destroyed.

399. Patric. J. H., and J. L. Gorman.
1978. Soil disturbance caused by skyline cable logging on steep slopes in West Virginia. J. Soil and Water Conserv. 33(1): 32-35, illus.

A URUS mobile skyline system removed an average of 32.6 m^3 (4,500 fbm) per hectare of hardwood logs from 16 ha (40 acres) of steep forest land in West Virginia. Six months after logging, we evaluated the area's

hydrologic performance. There was no evidence of reduced infiltration, increased bulk density, overland flow, or accelerated erosion, except on heavily used skid trails. The soil was severely disturbed (B horizon exposed) on less than 3 percent of the logged land; more than 90 percent was undisturbed.

400. Patric, James H., and Ernest M. Gould.
1976. Shifting land use and the effects on river flow in Massachusetts. J. Am. Water Works Assoc. 68(1): 41-45, illus.

A century ago, land formerly cleared for agriculture in Massachusetts began reverting to forest. It was thought that decreasing streamflow contributed to the decline of water power as the prime energy source in Massachusetts. Some further speculation concerns hydrologic effects of urbanization and of the 1938 hurricane on flow in these streams.

401. Patric, J. H., and J. H. Smith.
1978. Can cable logging better protect southern forests? Timber Harvesting 26(4): 32-33, illus.

This paper deals briefly with skyline cable logging as one means to lessen some effects of timber harvest on the forest soil, water, and recreation resources. Operating principles of the URUS, a small European skyline system, are outlined. Use of cable systems in West Virginia adequately protects most environmental values.

402. Patric, J. H., and G. R. Trimble, Jr.
1978. A broader view. (Letter to Editor.) Am. For. 84(3): 2-4.

403. Parker, B. L., R. S. Walters, H. B. Teillon, and C. M. Boulanger.
1977. Carbaryl residues in sugar maple sap. J. Econ. Entomol. 70(6): 785-788.

404. Parker, Johnson.
1977. Phenolics in black oak bark and leaves. J. Chem. Ecol. 3: 489-496.

Catechin, quercitrin, robinin, quercetin 3-methyl ether, scopoletin, cholorogenic acid, several leucoanthocyanins, and condensed and hydrolyzable tannins were identified in bark and leaves of Quercus velutina Lamarck. The concentrations of most phenolics in leaves increased as the growing season progressed, whereas those of most phenolics in bark remained essentially unchanged. Qualitative differences in bark and leaf phenolics among different trees were negligible.

405. Patric, J. H.
1976. Soil erosion in the eastern forest. J. For. 74: 671-677.

406. Paulick, R. K., and J. L. George.
1978. Determination of habitat components utilized by avian species in a planned suburban community. Research Briefs, Sch. For. Resour., Pa. State Univ. 11(1): 19-21.

407. Payne, Brian, and Richard DeGraaf.
1975. Economic values and recreational trends associated with human enjoyment of nongame birds. In Proc. Symp. Manage. For. Range Habitats Nongame Birds. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. WO-1. p. 6-10.

It is generally agreed that the enjoyment of nongame birds is an increasingly important recreational activity, perhaps rivaling hunting and fishing economically and in numbers of participants. But estimates of economic values and numbers of participants are scarce, and difficult to make. Land managers need better estimates of these values in deciding how much effort to devote to management of nongame birds.

408. Peters, John R., and Teresa M. Bowers.
1977. Forest statistics for Massachusetts. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-48. 43 p.

A report on the second inventory of the forest resources of Massachusetts, including trends of change in commercial forest-land acreage, volume of growing stock, and sawtimber volume. The report contains 32 tables of statistical data on forest land, timber volume, annual growth, removals, and mortality, and output of timber products.

409. Peters, John R., and Teresa M. Bowers.
1977. Forest statistics for Rhode Island. U.S. Dep. Agric. For. Serv. Resour. Bull. NE-49. 38 p.

A report on the second inventory of the forest resources of Rhode Island, including trends of change in commercial forest-land acreage, volume of growing stock, and sawtimber volume. The report contains 32 tables of statistical data on forest land, timber volume, annual growth, removals, and mortality, and output of timber products.

410. Pham, C. H., H. G. Halverson, and G. M. Heisler.
1978. Precipitation and runoff water quality from an urban parking lot and implications for tree growth. U.S. Dep. Agric. For. Serv. Res. Note NE-253. 6 p.

The water quality of precipitation and runoff from a large parking lot in New Brunswick, New Jersey were studied during the early growing season, from March to June 1976. Precipitation and runoff from 10 storms were analyzed. The runoff was higher in all constituents considered except for P, Pb, and Cu. Compared with published values for natural waters, sewage effluent, and storm-water drainage from urban land, the parking lot runoff was not highly polluted during the study period, and it appears that such runoff is a satisfactory source of water for urban trees.

411. Pham, C. H., Howard G. Halverson, and Gordon M. Heisler.
1978. Red Maple (Acer rubrum L.) growth and foliar nutrient responses to soil fertility level and water regime. U.S. Dep. Agric. For. Serv. Res. Pap. NE-412. 7 p., illus.

In a greenhouse experiment, red maple (Acer rubrum L.) seedlings grew best when available soil N was 25 ppm, P was 25 to 75 ppm, and K was 75 to 100 ppm. Fertilization was effective only when soil moisture was not limiting.

412. Phillips, W., G. Simmons, and T. Corcoran.
1976. Spruce budworm and a computer-based mapping and information retrieval system. Maine For. Rev. 9: 13-15.

413. Pierce, Robert S.
1977. Forest soil. In W. E. Sopper, J. A. Lynch, and E. S. Corbett, eds. Water resources at the forest-urban interface. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Res. PA-2. p. 29-32.

This paper, part of a treatise on various aspects of water resources and urban forest relationships, deals with forest soil considerations. The prospect of using forests for human waste disposal is receiving increased attention. Research is urgently needed to determine the ability of forest soil to accept waste water for long periods without irreversible, deleterious effects, and with adequate natural uptake of nutrients to prevent stream and lake entrophication

414. Plass, William T.
1977. Seeding and planting to achieve land-management objectives. In Energy technology handbook. MrGraw-Hill Book Co., New York. p. 1-102 to 1-116.

Land disturbed by surface mining is generally an undeveloped resource. Evidence indicates this land is capable of producing tangible and intangible benefits to society. Land management options may be increased if consideration is given to potential spoil characteristics and landforms before mining. Once an appropriate land-management objective has been selected, planning proceeds to achieve it. When vegetation is required, planning includes soil preparation, selection of species, seeding and planting, and cultural treatments to maintain the vegetative cover and maximize yield.

Intensive development and management of land disturbed by surface mining can contribute to the nation's economy.

415. Plass, William T.
1977. Growth and survival of hardwoods and pine interplanted with European alder. U.S. Dep. Agric. For. Serv. Res. Pap. NE-376. 10 p., illus.

European black alder was planted as a nurse crop for five hardwood and five pine species. After 10 growing seasons, the alder had had little effect on the survival of the interplanted species, but their height and diameter were greater in association with alder. Foliar analysis showed that the interplanted species had used nitrogen fixed by the alder.

416. Plass, William T.
1978. Use of mulches and soil stabilizers for land reclamation in the eastern United States. In Reclamation of drastically disturbed lands. Am. Soc. Agron., Madison, Wis. p. 329-337.

The use of a mulch or soil stabilizer should be considered one of several treatment options in plans for reclaiming drastically disturbed areas. Such use should supplement, not substitute for, basic treatments required for stabilizing and revegetating soil. In the humid eastern United States, a mulch or soil stabilizer is often applied to help establish vegetation and control erosion by surface runoff. Treatments may include mulches or soil stabilizers alone or in combination. Selection of treatments should be based on requirements for erosion control, site and climatic variables that may affect the establishment of vegetation, and the cost of achieving the site-protection objectives.

417. Plass, William T.
1978. Reclamation of coal-mined land in Appalachia. J. Soil & Water Conserv. 33(2): 56-61.

Impressive improvements in reclamation technology in the Appalachian region have been made during the past decade through the efforts of concerned individuals from several states representing government, education, and industry. As an era for development of fundamental reclamation technology ends, this review summarizes current practices from mining through the successful establishment of vegetation. Recent accomplishments have encouraged optimism about revegetation. In the years ahead, research and experience will lead to practical land use options for land disturbed by mining.

418. Plumley, Harriet J.
1977. Design of outdoor urban spaces for thermal comfort. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 152-162.

Microclimates in outdoor urban spaces may be modified by controlling the wind and radiant environments in these spaces. Design guidelines were developed to specify how radiant environments may be selected or modified to provide conditions for thermal comfort. Fanger's human-thermal-comfort model was used to determine comfortable levels of radiant-heat exchange for various activities, clothing types, and climatic conditions. A comparison of these radiant quantities with measured and calculated quantities of radiant exchange expected for a person in urban spaces revealed several design guidelines.

419. Plumley, Harriet J., Harry T. Peet, and Raymond E. Leonard.
1978. Records of backcountry use can assist trail managers. U.S. Dep. Agric. For. Serv. Res. Pap. NE-414. 19 p., illus.

Backcountry visitor records of overnight site use can provide beneficial and practical information for making decisions on backcountry facilities. Data from the Long Trail in Vermont have been used to indicate the types of information that can be obtained from visitor use records.

420. Podgwaite, J. D., and R. B. Bruen.
1978. Procedures for the microbiological examination of production batch preparations of the nuclear polyhedrosis virus (Baculovirus) of the gypsy moth. For. Serv. Gen. Tech. Rep. NE-38. 8 p., illus.

Procedures for the microbiological examination of production batch preparations of the nuclear polyhedrosis virus of the gypsy moth are described. They include methods to count total bacteria and to detect fecal coliform and primary pathogenic bacteria in the preparations. These procedures are consistent with safety guidelines established by the U.S. Environmental Protection Agency (EPA) and they are adaptable for use in the examination of other insect virus preparations.

421. Podgwaite, J. D., and P. R. Galipeau.
1978. Effect of nucleopolyhedrosis virus on two avian predators of the gypsy moth. U.S. Dep. Agric. For. Serv. Res. Note NE-251. 2 p.

The nucleopolyhedrosis virus (NPV) of the gypsy moth was fed to black-capped chickadees and house sparrows in the form of NPV-infected gypsy moth larvae. Body weight and results of histological examination of organs of treated and control birds indicated that NPV had no apparent short term effect on these two important predators of the gypsy moth.

422. Pogge, Franz L.
1976. Book review: Shrubs and vines for northeastern wildlife. Castanea 41: 272-273.

423. Pottle, H. William, and Alex L. Shigo.
1974. Treatment of wounds on Acer rubrum with Trichoderma viride. Proc. Am. Phytopathol. Soc. 1: 142.

424. Pottle, H. W., A. L. Shigo, and R. O. Blanchard.
1977. Biological control of wound hymenomycetes by Trichoderma harzianum. Plant Dis. Rep. 8: 687-690.

425. Powell, Douglas S., and Teresa M. Bowers.
1978. A preview of Maryland's forest recource. U.S. Dep. Agric. For. Serv. Res. Note NE-252. 7 p., illus.

The 1976 forest survey of Maryland shows that the state has 2.5 million acres of commercial forest land, a decline of 13 percent since 1964. Ninety percent of it is in private ownership; 56 percent in sawtimber stands; 46 percent in the oak-hickory forest type. Timber volume has increased to 3.5 billion cubic feet of growing stock and 8.2 billion board feet of sawtimber. Seventy-three percent of the growing-stock volume is in sawtimber stands and 49 percent is in oak-hickory types. In a state that is dominated by hardwoods, loblolly pine is the single species with the most volume. Net growth exceeds removals for the state as a whole, but overcutting is occurring in certain units and in certain species.

426. Pritchard, W. Maurice, and Kuldip P. Chopra.
1977. Air pollution and urban climatology at Norfolk, Virginia. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 278-284.

The atmosphere at Norfolk is usually stable, with no strongly prevailing wind direction. Linear regression analyses of visibility data indicate a generally decreasing visibility trend between 1960 and 1972, with a possible trend reversal in later years. A 44 percent increase in the annual frequency of 0-4-mile visibility occurred in 1960-72. Similar analyses of precipitation data for 1960-74 show a slight increase in the annual number of days with precipitation exceeding 0.01 inch. The correlation coefficient between the annual frequencies of low (0-4-mile) visibility and days with precipitation greater than 0.01 inch was rather small and negative.

427. Pyszyński, W.
1977. Mechanism of formation of spiral grain in Aesculua stems: Dissymmetry of deformation of stems caused by cyclic torsion. Acta Soc. Bot. Pol. 46: 501-522.

Can asymmetrical recovery from wind twisting be blamed for spiral grain in trees? Pieces of Aesculus hippocastanum stems were twisted to the left and to the right in a laboratory device and then allowed to recover. Residual torsions to the right were always greater than those to the left. Also the fibrillar helix in the cell walls was always to the right. This asymmetry in mechanical properties of the stem may be responsible for the formation of right-oriented spiral grain in Aesculus subjected to natural wind action.

428. Pyszýnski, Wladyslaw.
1977. Complex wavy grain in the stem of Aesculus. Acta Soc. Pol. 46: 231-249.

Wavy grain, interlocked grain, and spiral grain are based on moving patterns of areas of cambium within which certain cellular events are oriented predominantly to the right or to the left, rather than randomly. Two types of wavy grain, long wave and short wave (about 80:1 in length) were found to be superposed onto the obvious spiral pattern. Both were explainable by cambial domain patterns, but the long-term spiral may have another basis in asymmetrical recovery of the wood from wind-induced torsion.

429. Rafaill, Barbara L., and Willis G. Vogel.
1978. A guide for vegetating surface-mined lands for wildlife in Eastern Kentucky and West Virginia. U.S. Dep. Inter. Fish and Wildl. Serv. FWS/OBS-78/84.

430. Reardon, Richard, William Metterhouse, and Robert Balaam.
1977. Traps for collecting adult parasites of the gypsy moth. J. Econ. Entomol. 70(2): 247-249.

Adult parasites of the gypsy moth, Lymantria dispar L., were collected in Malaise, McPhail, and sticky-tube traps located within three vertical strata: tree crown, bole, and ground. A total of 37,924 adults belonging to the families Braconidae, Chalcididae, Ichneumonidae, Sarcophagidae, and Tachinidae were collected. Malaise traps collected 99% of the Hymenoptera and 100% of the ichneumonid and braconid parasites of the gypsy moth.

Malaise and McPhail traps collected 71 and 27%, respectively of the tachinid parasites of the gypsy moth. The relative abundance of the captured tachinids Compsilura concinnata (Meigen), Blepharipa pratensis (Meigen), and Parasetigena silvestris (Robineau-Desvoidy) depended upon the type of trap.

431. Reethof, G., O. H. McDaniel, and G. M. Heisler.
1977. Sound absorption characteristics of tree bark and forest floor. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 206-217.

Results of basic research on absorption of sound by tree bark and forest floors are presented. Amount of sound absorption by tree bark was determined by laboratory experiments with bark samples in a standing-wave tube. A modified portable standing-wave tube was used to measure absorption of sound by forest floors with different moisture contents, with and without leaf litter, and with and without moss. The implications of the results are discussed in terms of the amount and mechanisms of sound absorption by entire forests.

432. Rexrode, Charles O.
1977. Cacodylic acid reduces the spread of oak wilt. Plant Dis. Rep. 61: 972-975.

Cacodylic acid was pressure-injected into the xylem of oak-wilt-infected trees to determine its effectiveness in preventing development of oak bark beetles and fungus mats and spread of the pathogen to healthy oaks. The treatment reduced by 75% the number of oak-wilt trees infested with oak bark beetles and by 61% the number producing the fungus mats. During the last two years of this 4-year study, the net reduction in number of diseased trees was 48% and the net reduction in number of active infection centers was 38%.

433. Rexrode, Charles O.
1978. Stem deformity in black cherry. U.S. Dep. Agric. For. Serv. Res. Pap. NE-411. 6 p., illus.

Insects, diseases, frost, and browsing by deer were the major sources of injury to terminal shoots of black cherry seedlings and saplings. Twenty-seven species of insects from 19 families and 5 orders were associated with young black cherry trees. Of these species, Archips spp., and Cecidomyia serotinae O.S., caused the most stem deformity in black cherry. Damage by these insects ranged from 0 to 43 percent per year on six study areas.

434. Rexrode, Charles O., and Robert E. Frame.
1977. Root graft incidence at oak wilt sites in West Virginia. Plant Dis. Rep. 61: 970-975.

In northeastern West Virginia, 29 oaks infected with oak wilt fungus were pressure injected with cacodylic acid. Chemical damage was found in 12 healty oaks that were adjacent to the injected trees. Thirty-one percent of the injected infected trees were connected by root grafts to the healthy trees; this study shows that root grafting between oaks in northeastern West Virginia is more prevalent and potentially more important in the incidence and spread of oak wilt fungus than was previously reported.

435. Reynolds, Hugh W.
1976. Furniture parts from pulpwood--a plant that did it. 4th Annu. Hardwood Symp. Hardwood Res. Counc., Cashiers, N.C. 4 p.

436. Reynolds, Hugh W.
1978. Yellow-poplar furniture: weatherwood finish. In Marketing and utilization of yellow-poplar: Symp. Proc. Knoxville, TN March 21-22, 1978. Inst. Agric. Univ. Tenn. p. 171-174

437. Reynolds, James W., [Hugh W.], and James Schroeder.
1977. System 6--a way to use small logs to make grade lumber for furniture cuttings. South. Lumberman 234 (2897): 9-10.

A new method for sawing small hardwood logs to grade lumber has been developed. The logs are bucked to

6-foot bolts, which are sawed to 1-inch boards in pallet-part sawmills. These boards are packaged for unit load handling into forced-air dryers and then into dry kilns. Hardwood lumber grade rules, modified for the 6-foot length, are used to establish board grades and lumber value. The kiln-dried boards are reduced to furniture cuttings in newly designed rough mills.

438. Reynolds, Hugh W., and James Schroeder.
1978. Furniture cuttings made from logging residue: the three-sided cant system. U.S. Dep. Agric. For. Serv. Res. Pap. NE-417. 4 p.

439. Rhodes, A. F., and E. Brennan.
1977. Vegetation and air quality. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 303-307.

Chemical monitoring is the classical way of defining air quality. However, the ability of plants to reflect changes in air quality must not be overlooked because certain species respond in definite ways to gaseous pollutants. In New Jersey, chemical-monitoring data supported plant-injury data for SO_2. While oxidant concentrations seemed to agree with plant data, recent changes in monitoring procedures have made the relationship unclear. Plant data have provided the only evidence for the presence of toxic amounts of fluoride in the air and have warned of the existence of as yet unidentified substances that impair air quality.

440. Roach, Benjamin A.
1977. A stocking guide for Allegheny hardwoods and its use in controlling intermediate cuttings. U.S. Dep. Agric. For. Serv. Res. Pap. NE-373. 30 p.

A stocking guide for stands of Allegheny hardwoods (sugar maple or sugar maple-beech with various admixtures of black cherry, red maple, white ash, sweet birch, and other species) on the Allegheny Plateau in

northwestern Pennsylvania. Included are procedures for evaluating stocking and stand conditions, thinning even-aged stands, determining minimum residual stocking, distributing the basal-area cut in a stand, and using the guide for selection cutting.

441. Robertson, Douglas L., and Rowan A. Rowntree.
1977. Behavorial significance of milieu: a consideration of two downtown settings. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 399-407.

Behavior patterns in parks and plazas in downtown Syracuse, New York, are discussed. After an introduction of the spaces and their principal users, fundamental concepts borrowed from ecological psychology are defined. Then using these concepts, the behavioral significance of the environment is illustrated in a comparison of two case studies. The concepts employed here are shown to allow a discussion of the important effect of environment on behavior without producing deterministic distortions.

442. Romberger, J. A.
1978. Meristems, growth, and development in woody plants: An analytical review of anatomical, physiological, and morphogenic aspects. Allanheld, Osmun & Co., and Universe Books, Montclair, N.J. 214 p.

A reprint with a new preface of Forest Service Technical Bulletin 1293, 1963.

443. Romberger, J. A. (General Ed.; R. H. Foote. L. Knutson, P. L. Lentz Assoc. Eds.)
1978. Beltsville symposia in agricultural research. 2. Biosystematics in agriculture. Allanheld, Osmun & Co., and John Wiley & Sons, Montclair, N.J., and New York. 340 p.

444. Romberger, J. A., and Robert A. Gregory.
1977. The shoot apical ontogeny of the Picea abies seedling. III. Some age-related aspects of morphogenesis. Am. J. Bot. 64: 622-630, illus.

Shoot apical meristems of young spruce seedlings are capable of rapid growth. Such meristems can produce new tissue to the extent of 20 to 35% of their own volume each day. Younger, smaller apices grow faster, but produce less because they are smaller. Most of the volume growth is invested in new stem internodes, but a variable fraction is retained by the meristem, increasing its "capital volume." This "investment ratio" is as high as 20% in meristems of 10-day-old seedlings, but declines to zero with age. Because the investment ratio determines apical meristem volume it has a large effect on shoot growth potential. We now need to know how it is controlled.

445. Rothwell, Frederick M., and Coleman Holt.
1978. Vesicular-arbuscular mycorrhizae established with Glomus fasciculatus spores isolated from the feces of cricetine mice. U.S. Dep. Agric. For. Serv. Res. Note NE-259. 4 p., illus.

Cricetine mice were trapped on two revegetated surface-mined areas--one with a freshly seeded grass-legume cover and one with an early successional grass-forb cover. Chlamydospores of Glomus fasciculatus isolated from the feces of these animals produced representative endomycorrhizae with corn under greenhouse conditions.

446. Rye, Arthur H., and Russell S. Walters.
1977. Maple spout modification shows no advantage. Natl. Maple Syrup Dig. 16(1): 17-19.

In an attempt to extract more sap from sugar maple tapholes, plastic spouts were modified by cutting a 1/2-inch long slot in the top and bottom of the part that is inserted in the taphole. A comparison of the modified spouts with unmodified spouts did not show a difference in either sugar content or volume of sap collected.

447. Safford, Lawrence O., and Miroslaw M. Czapowskyj.
1977. Effects of fertilization on the soil and foliar nutrient status and growth rate of a 15-year-old pioneer hardwood stand in eastern Maine. (Abstr.) Agron. Abstr. 1977: 183.

A previously thinned pioneer hardwood stand with a scattered spruce-fir understory was treated with lime, N, and P singly and in several combinations. Lime had little or no effect on nutrient content of foliage or growth response. Basal area growth of the aspen-birch stand responded primarily to N, increasing 66 percent in the first 2 years after treatment. NP combinations produced an even greater growth response.

448. Safford, L. O., H. E. Young, and T. W. Knight. 1977. Effect of soil and urea fertilization on foliar nutrients and basal area growth of red spruce. Univ. Maine Life Sci. Agric. Exp. Stn. Bull. 740. 27 p.

Individual mature red spruce trees growing on three soil series were fertilized with urea. Foliar nutrient levels and basal area growth were observed for 5 and 7 years, respectively. The nutrient content of red spruce needles varied greatly from year to year even though samples were collected during the dormant season. Soil series influenced foliage nutrient content of control trees as well as effect of N fertilizer on foliage nutrient level and basal area growth. The effects of urea on foliage nutrient level, needle weight, and basal area growth were neither great nor long lived.

449. Sarles, Raymond L., and David M. Emanuel. 1977. The mobile bark blower: an evaluation of performance and costs. U.S. Dep. Agric. For. Serv. Res. Pap. NE-368. 9 p., illus.

A custom-built bark blower truck (MOBLOW) developed in Oregon was tested for its effectiveness in applying bark mulches, sawdust, and shavings in the eastern United States. Tests determined the bark blower's performance and cost in mulching grass-legume seedings and shrub beds with 10 bark products or wood residues. Bark blower trucks built to MOBLOW specifications can effectively apply pine and hardwood bark products, sawdust, and wood shavings, but cannot handle unprocessed bark residues. Blower trucks can be used to blow shredded bark, sawdust, and shavings into barns, cattle sheds, poultry houses, show rings, and corrals, and to deliver hogged fuel.

450. Sarles, Raymond L., and David M. Emanuel.
1977. Hardwood bark mulch for revegetation and erosion control on drastically disturbed sites. J. Soil & Water Conserv. 32: 209-214, illus.

Use of bark as a mulch on seeded areas offers an outlet for large amounts of this timber mill residue. Experiments at five locations in southern West Virginia showed that bark compares favorably with straw and wood-fiber mulches for stabilizing soils on disturbed sites. Based on findings from the five experiments, bark applications of 30 and 50 cubic yards per acre are recommended. Slopes steeper than 2:1 and those facing south and west need the heavier application, as do sites exposed over winter. The experiments also demonstrated that improved equipment is needed to apply mulch efficiently.

451. Schmitt, D. M.
1977. The role of tree improvement in the Northeast: a geneticist's point of view. Northeast. For. Tree Improv. Conf. Proc. 25: 65-75.

The author estimates the amount of plantable forest land in the Northeast and concludes that there is enough (approximately 40.5 million acres) to support tree improvement programs. The balance of the paper describes biological factors that influence tree improvement investment decisions and how a forest geneticist's special knowledge can contribute to tree improvement opportunity analyses.

452. Schreiber, L. R., T. W. Jones, G. F. Gregory.
1978. Control of Dutch elm disease: comparison of benomyl and methyl 2-benzimidazolecarbamate hydrochloride, and two injection techniques. Plant Dis. Rep. 62: 761-765, illus.

Benomyl fungicide (methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate) as the 50% insoluble wettable powder formulation or as water-soluble methyl 2-benzimidazolecarbamate hydrochloride (MBC-HCl), was injected into American elm trees to control Dutch elm disease. The MBC-HCl solutions contained MBC at concentrations either approximately equal to or five to

six times that contained in the benomyl 50 WP. Chemicals were injected into the trunk 1 m above the soil line and 2.5 to 3.5 cm into the xylem or at the soil line in the outer two or three annual rings. Dutch elm disease was controlled by prophylactic treatments with MBC-HCl at the higher rate using both injection systems, and by the therapeutic treatment at the same rate with the second system. Residual fungitoxicants were found in trunk and twig samples in trees of all treatments but in a higher percentage of trees treated prophylactically with the higher rate of MBC-HCl.

453. Schuler, Albert T.
1978. The insulation board industry -- an econometric analysis. U.S. Dep. Agric. For. Serv. Res. Pap. NE-407. 8 p., illus.

An econometric model of the domestic insulation board industry was developed to identify and quantify the major factors affecting quantity consumed and price. The factors identified were housing starts, residential improvement activity, disposable personal income, productivity, pulpwood and residue prices, and power costs. Disposable personal income was the most important of these factors, affecting both quantity and price. Annual projections of quantity and price show quantity increasing by 30 percent and price by 106 percent by the year 1990.

454. Schuler, Albert T., H. H. Webster, and J. C. Meadows.
1977. Goal programing in forest management. J. For. 75: 320-324.

Managing resources for multiple use requires complex decisions that involve many diverse goals. Goal programing provides a way of analyzing such decisions and evaluating tradeoffs. The method was used in a pilot study to prepare a management plan for a 10,000-acre area on a national forest. It proved valuable both in maximizing the attainment of diverse goals and in showing that one goal was unrealistic.

455. Seegrist, Donald W.
1977. Two-way interaction when there is a linear relationship among the pairs of means in a factorial experiment. Northeast. For. Tree Improv. Conf. Proc. 25: 143-153.

This paper discusses the statistical analysis of genetic experiments when there is a linear relationship among the response of families planted at different locations. The hypothesis of no family x location interaction is equivalent to the hypothesis that there is a linear relationship among the family means and the slope of line among the means is unity (1.0). If the hypothesis of "no two-way interaction" is rejected, one should estimate the slope coefficient from the variance and covariance components of variance. A method of testing the hypothesis that the slope is zero is suggested. The test is based on ANOVA procedures.

456. Seegrist, Donald W., and Stanford L. Arner.
1978. Statistical analysis of linear growth and yield models with correlated observations from permanent plots remeasured at fixed intervals. In Growth models for long term forecasting of timber yields. Publ. FWS-1-78, School For. Wildl. Resour. Va. Polytech. Inst. and State Univ. p. 209-223.

457. Seliga, Thomas A.
1978. Summary of the first international symposium and workshop on acid precipitation and the forest ecosystem. Ohio State Univ. Rep. AS-S-101: 39 p.

458. Seliga, Thomas A., and L. S. Dochinger.
1976. First International Symposium on Acid Precipitation and the Forest Ecosystem. Water, Air, & Soil Pollut. 6: 135.

A brief report of the Symposium.

459. Semonin, Richard G.
1977. Temporal and spatial variability of rainfall pH. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 53-61.

The distribution of average rainwater pH over an area of 1,800 km^2 containing 81 collectors was determined from 25 storm events. The areal average of the data was pH 4.9, with a range of values from 4.3 to 6.8. A single storm event was studied to determine the change of pH as a function of time. The initial rain was pH 7.1, decreasing to 4.1. An excellent agreement was observed between the H+ deposition rate and the rainfall rate.

460. Sendak, Paul E.
1978. Birch sap utilization in the Ukraine. J. For. 76: 120-121, illus.

Birch sap is used to make beverages in the Ukraine. Unlike the maple sap used in North America for syrup and sugar, that from birch (Betula verrucosa Ehrh., B pubescens Ehrh.) is not boiled down; it is mixed with sugar and citric acid. Similarities between the birch and maple enterprises suggest that innovations in one might be adopted by the other.

461. Sendak, Paul E.
1978. Consumer preference for graded maple syrup. U.S. Dep. Agric. For. Serv. Res. Pap. NE-402. 11 p., illus.

The three grades of maple syrup and a commercial table syrup containing artificial flavor and 3 percent pure maple syrup were evaluated by 1,018 women in four cities. The results indicate that differences in preference for flavor are related to how close the respondents are to a maple syrup production region. Differences in preference among grades of pure maple syrup were slight and in reverse order of the quality implied by the Federal grading standard. Outside of the region of maple syrup production, differences in preference between pure maple syrup and the commercial table syrup were marked, and favored the commercial syrup.

462. Sendak, Paul E., and Lawrence D. Garrett.
1976. A different view of price trends--A letter to the editor. Natl. Maple Syrup Dig. 15(3): 14-15.

463. Sendak, Paul E., Mariafranca Morselli, and David E. Bee.
1978. Storage of U.S. Grade AA maple syrup in the retail package. J. Food Sci. 43(1978): 1002-1005, illus.

Six types of containers for maple syrup were evaluated under three controlled temperatures at four storage intervals. The contents of each container were analyzed for optical density (color), density pH, and flavor. If a good quality U.S. Grand AA maple syrup, properly hot-packed, is stored no longer than 6 months in the retail container at a temperature of 24°C, quality, as measured by color, density, pH, and flavor, will be maintained in the containers we evaluated. However, in some plastic containers, syrup stored for 9 and 12 months at 24° and 30°C, darkened enough to drop one grade level with a significant deterioration of flavor in one of the containers.

464. Shafer, Elwood L.
1977. Research needs for programs that provide natural environments for children. In: Children, Nature, and the Urban Environment. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-30, p. 215-217.

465. Shafer, E. L., Jr., and R. O. Brush.
1977. How to measure preferences for photographs of natural landscapes. Landscape Plann. 4: 237-256.

466. Shigo, A. L.
1976. Decay: A problem in both young and old trees. Am. Nurseryman 1: 24-27.

Decay is thought to be a problem only in old trees, but it is not. Wounds on small trees can also start the processes that could lead to decay. Too often it

is the accumulation of many small columns of decay early in the life of the tree that results in serious problems later in the life of the tree. A general review of compartmentalization and successions is given.

Shigo, Alex L.
1976. Decay in trees. N.H. For. Notes 127: 42-44, illus.

A general review of the decay process in living trees. Compartmentalization and successions are described. A decay model is given. Some key points to help the forester understand decay are given.

Shigo, A. L.
1977. When to call the tree doctor. McCall's (April): 55.

Shigo, A. L.
1977. Protecting your beautiful trees. Woman's Day (Nov.).

Shigo, A. L.
1977. Injection wounds in elm. In The current state of the art of Dutch elm disease control: Proc. Symp. No. 1, Natl. Arborist Assoc. p. 54-56.

Shigo, A. L.
1977. Quotables by Tom Stevenson. Am. Hortic. (April): 57.

Shigo, Alex L.
1977. Superior tree production fights tree wound fatalities. Am. Nurseryman 146(12): 10-11, illus.

We know now that some trees of the same species can respond more effectively to wounds than others. We must start programs to develop such trees, especially for our cities where wounding is a major problem.

473. Shigo, A. L.
1978. Tree decay: time to expand the concept. IUFRO Proc. Kassel, Germany. p. 298-305.

474. Shigo, Alex L.
1977. CODIT and the Shigometer work in the South. South. Lumberman 234(2): 10-11, illus.

CODIT is a model that explains in simple terms how decay develops in living trees. The Shigometer is an electrical device that detects decay in living trees. The CODIT system and the Shigometer work on trees in the South.

475. Shigo, Alex L.
1977. Communication of knowledge and needs between forest researchers and practicing foresters. North. Logger 25(12): 7, 38.

Forest researchers have produced a wealth of knowledge about trees, but not enough of it reaches the practicing foresters who need it and can use it. Some possible reasons for this are discussed, and the need for improving two-way communication between forest researchers and practicing foresters is emphasized.

476. Shigo, Alex L.
1977. A new look at tree care. Arboric. J. 3(3): 157-164, illus.

Decay is a major cause of damage to trees throughout the world. Most tree owners learn about decay after it is too late--when a tree falls on a car, a power line, or worse yet, a person. Much can be done to prevent decay and to minimize its impact on trees. The best way to help the tree is to understand the problem. What is decay? How does it start? What can be done about it? This paper gives some answers that have come from 17 years of research on decay, during which more than 5,000 trees--conifers, hardwoods, and tropical trees--were dissected and studied carefully.

477. Shigo, Alex L.
1977. Phialophora melinii: inoculations in wounded red maple. Phytopathology 67: 1333-1337, illus.

Isolations from discolored wood associated with wounds previously inoculated with Phialophora melinii in Acer rubrum showed that the fungus was present in all 1.5- to 26-month-old wounds. Hymenomycetes from natural sources were not isolated from wounds less than 4 months old. Wounds on trees inoculated with P. melinii yielded fewer Hymenomycetes than did non-inoculated wounds. The fungus thus acted as an aggressive invader and a long-term inhabitant of discolored wood.

478. Shigo, Alex L.
1978. Dealing with decay factors in our urban forests. Weeds, Trees and Turf 17(11): 14-18, illus.

We have tamed our urban trees. We are responsible for their care. A quick look at the condition of some of our urban trees will show that we have not met our responsibility. We seem to see more and more urban trees in trouble. Is it because we are becoming more aware of our trees? Or is it because the condition of our trees is declining? Probably both.

479. Shigo, Alex L., and Richard Campana.
1977. Discolored and decayed wood associated with injection wounds in American elm. J. Arboric. 3(12): 230-235.

Dissection of 80 large American elm trees with a chainsaw revealed discolored and decayed wood associated with holes drilled for injections to control Dutch elm disease. Discolored wood was associated with every injection wound; injection wounds made in several successive years caused severe internal injuries. Until less injurious injection methods are developed, we suggest that injection holes be as small, shallow, clean-edged, and few as possible. Later injection

sites should be at least 46 cm (18 in) above and not directly over older ones. If possible, drilling should be avoided at budbreak and in the valleys of fluted roots.

480. Shigo, A. L., and H. G. Marx.
1977. Compartmentalization of decay in trees. U.S. Dep. Agric. For. Serv. Agric. Bull. 405. 73 p.

A model system is given that describes how decay develops in living trees. The system is called CODIT, an acronym for Compartmentalization Of Decay In Trees. An understanding of CODIT will help to clarify many misconceptions about decay in living trees.

481. Shigo, Alex L., and Walter E. Money, and Dale I. Dodds.
1977. Some internal effects of Mauget tree injections. J. Arboric. 3(11): 213-220, illus.

Negligible amounts of discolored wood and cambial dieback were associated with control Mauget injection wounds (no chemicals added) made 1 year earlier on red maple, white oak, and shagbark hickory. Columns of discolored wood and some cambial dieback were associated with wounds that had been injected with Bidrin or Meta-Systox-R. Columns of discolored wood and very little cambial dieback were associated with wounds that had been injected with Fungisol or Stemix. Injured tissues associated with all wounds were compartmentalized in the wood present at the time of injection; wood that formed subsequently was not infected.

482. Shigo, Alex L., and Walter C. Shortle.
1977. "New" ideas in tree care. J. Arboric. 3(1): 1-6.

Some controversy has arisen over statements made recent in this journal about wound dressings, cavity fillings, and boring holes in trees. Some quotations from other researchers are given here as support for the statements. Often what is considered new is really a restatement of older information, or sound older

information may be combined with information from recent studies to form conclusions that can be considered new.

483. Shigo, Alex L., Walter Shortle, and Peter Garrett. 1977. Compartmentalization of discolored and decayed wood associated with injection-type wounds in hybrid poplar. J. Arboric. 3(6): 114-118, illus.

Sixty trees representing nine different clones of Populus deltoides X P. trichocarpa hybrids were wounded in 1975, each tree receiving 14 drill wounds. Dissections of these trees after 6 months revealed several patterns of healing, ranging from poor closure and compartmentalization to excellent closure and compartmentalization. The results show that it is difficult to generalize on the healing patterns of injection-type wounds. One tree may have a strong healing response and another tree of the same species may have a weak response. The wound response seems to be under genetic control.

484. Shigo, Alex L., Walter C. Shortle, and Peter W. Garrett. 1977. Genetic control suggested in compartmentalization of discolored wood associated with tree wounds. For. Sci. 23: 179-182, illus.

Nine trees in three clones of Populus deltoides X P. trichocarpa compartmentalized effectively the discolored wood associated with wounds: after 6 months only small columns of discolored wood were associated with the 14 experimentally inflicted wounds per tree. Eighteen trees in six other clones compartmentalized poorly the discolored wood associated with wounds: after 6 months large columns of discolored wood were associated with the wounds. Wound closure and tree diameter were not related to percentage of stem that was discolored. The results suggest that compartmentalization of discolored wood associated with wounds may be under genetic control.

485. Shigo, Alex L., Walter C. Shortle, and Julian Ochrymowych.
1977. Detection of active decay at groundline in utility poles. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-35. 26 p., illus.

Active wood decay at groundline in in-service utility poles can be detected by a skilled inspector using:
1. A knowledge of basic patterns of decay.
2. Recognition of obvious signs of decay.
3. Proper interpretation of information obtained from a pulsed-current meter--Shigometer®--used with various probes and probing techniques.

486. Shigo, A. L., and C. L. Wilson.
1977. Wound dressings on red maple and American elm: effectiveness after 5 years. J. Arboric. 3: 81-87.

Closure and internal compartmentalization of wounds on red maple and American elm were not stimulated by dressings of an asphalt-based material, orange shellac, or polyurethane varnish. After 5 years, decay fungi had infected many treated and control wounds. Some trees closed wounds rapidly; others closed wounds slowly regardless of the treatments.

487. Shigo, A. L.
1978. Wounded trees. Changing Times 32 (June): 37.

488. Shigo, A. L., and R. Campana.
1977. Discoloration and decay associated with treatment wounds from chemical injection of elms to control Dutch elm disease. Proc. Am. Phytopathol. Soc. 4: 218-219.

489. Shigo, Alex L., Nelson F. Rogers, E. Allen McGinnes,Jr. David T. Funk.
1978. Black walnut on Kansas strip mine spoils: some observations 25 years after pruning. U.S. Dep. Agric. For. Serv. Res. Pap. NE-393. 14 p., illus.

Dissections of 14 slow-growing black walnut trees on a strip-mine site revealed that bands of discolored heartwood were associated with pruned and nonpruned branch stubs. Ring shakes were associated with a few pruned and nonpruned stubs, especially with groups of stubs at the same position on the stem. The advantage of early pruning was that even the defects that developed were compartmentalized within the small nonmerchantable central core that was the diameter of the tree at the time of pruning.

490. Shortle, W. C.
1976. Tree care: A new look. Proc. Midwest. Chapter Int. Shade Tree Conf. p. 33-35.

491. Shortle, Walter C.
1977. Decay in trees: evaluating the hazard tree. Park Maintenance 30(5): 17-18.

Decay in trees can create a hazard to people and property. One of the ways to tell the hazard potential of a tree is to look for obvious indicators of decay - wounds that begin to decay and fruit bodies of decay fungi. Sometimes there are no obvious indicators. A new electronic device, the Shigometer, can help determine the internal condition of trees. To prevent decay problems, begin a program to keep trees healthy, and be aware of new information on decay and tree care.

492. Shortle, W. C.
1977. Compartmentalization of decay in red maple and hybrid poplar trees. Proc. Am. Phytopathol. Soc. 4: 86.

493. Shortle, W. C., and E. B. Cowling.
1978. Development of discoloration, decay, and microorganisms following wounding of sweetgum and yellow-poplar trees. Phytopathology 68: 609-616.

494. Shortle, W. C., and E. B. Cowling.
1978. Interaction of live sapwood and fungi commonly found in discolored and decayed wood. Phytopathology 68: 617-623.

495. Shortle, W. S., A. L. Shigo, P. Berry, and J. Abusamra.
1977. Electrical resistance in tree cambium zone: relationship to rates of growth and wound closure. For. Sci. 23: 326-329.

Resistance to a pulsed electric current in the cambial zone of sprout red maple and hybrid poplar was inversely proportional to rate of growth. In hybrid poplars, resistance was also inversely proportional to rate of wound closure, but not to amount of wood discoloration.

496. Shortle, W. C., A. L. Shigo, J. Ochrymowych.
1978. Patterns of resistance to a pulsed electric current in sound and decayed utility poles. For. Prod. J. 28(1): 48-51, illus.

Patterns of electrical resistance measured at groundlines were determined for 174 utility poles representing combinations of 7 species and 5 preservative treatments. Criteria developed from these patterns correctly indicated the internal condition of wood in 161 (93%) of 174 poles. Internal voids were detected during drilling prior to taking electrical measurements in seven poles. A decrease of one or more readings to 75 percent of the highest reading generally indicated decayed wood. Sometimes no decayed wood was found when this criterion was applied, but no decayed wood escaped detection within the limits of our ability to see symptoms of decay. A problem in distinguishing between sound and decayed wood in some poles was caused by off-scale readings.

497. Sisterson, Douglas L., and Richard A. Dirks.
1977. The urban moisture climate. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 26-35.

Data collected on 26 July 1974 as a part of project METROMEX in St. Louis show the three-dimensional structure of the urban moisture field. Mesoscale dry regions at the urban surface, corresponding to large residential and light industrial land use, were responsible for a reduction in specific humidity in the urban mixing layer. Anthropogenic sources and sinks of water vapor were estimated and found to be insignificant as summer daytime mesoscale influences on the atmospheric water balance of the urban area. The effects of reduced moisture in the urban area are directly related to the urban heat island, visibility, fog, precipitation, and human comfort in our cities.

498. Skipka, K. J., and D. B. Smith.
1977. Development of alternative sulfur dioxide control strategies for a metropolitan area and its environs, utilizing a modified climatological dispersion model. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 285-294.

Alternative control strategies were developed for achieving compliance with ambiant air quality standards in Portland, Maine, and its environs, using a modified climatological dispersion model (CDM) and manipulating the sulfur content of the fuel oil consumed in four concentric zones. Strategies were evaluated for their impact on ambient air quality, economics, and fuel oil resources. Based on these evaluations, a control strategy best suited for meeting the needs of the Portland area could be recommended.

499. Smith, H. Clay.
1977. Height of tallest saplings in 10-year-old Appalachian hardwood clearcuts. U.S. Dep. Agric. For. Serv. Res. Pap. NE-381. 6 p., illus.

Stem characteristics, mainly height, of the tallest hardwood saplings in 10-year-old circular clearcut openings were evaluated for several Appalachian hardwoods in West Virginia. Heights of the tallest saplings were not influenced by cardinal directions on two oak sites. Saplings were taller near the center of 150-, 200-, and 250-foot openings than saplings in

the center of the 50- and 100-foot openings. Saplings in the larger openings (150- to 250-foot) were significantly taller near the opening center than the tallest saplings along the borders of the same size openings. For small openings (100-foot or less), the border effect was present throughout the openings.

500. Smith, H. Clay.
1977. Changes in tree density do not influence epicormic branching of yellow-poplar. U.S. Dep. Agric. For. Serv. Res. Note NE-239. 3 p.

Epicormic branching was studied in a West Virginia yellow-poplar stand thinned to various tree density levels. Study trees in the 55- to 60-year-old second-growth stand were primarily codominant in crown class with 32 to 48 feet of log height. Eight-year study results indicated that yellow-poplar trees in this age class and locale could be thinned without serious loss of log quality from epicormic branching.

501. Smith, H. Clay.
1977. Killing grapevines with herbicides. North. Logger 25(7): 9, 33.

Grapevines, along with snow or ice, can seriously damage hardwood trees, especially those in even-aged stands on good oak sites. Four mistblowing treatments and one pellet treatment was used to kill grapevines in West Virginia. Study results indicated that all herbicides killed grapevines, but the most effective treatment was was with Tordon 10K pellets.

502. Smith, H. Clay.
1977. Results of precommercial thinning in very young Appalachian hardwood stands. North. Logger 26(6): 24-25.

Studies of early crop-tree release at three sites on th Fernow Experimental Forest indicated that yellow-poplar black cherry, northern red oak, or sugar maple crop trees of seedling origin should not be released 7 to 9 years after clearcutting. Release usually did not

stimulate height growth, and it had little effect on diameter growth. Exceptions were dominant and co-dominant red maple sprouts on a fair-quality site (site index 60 for northern red oak).

503. Smith, Clay.
1978. Skyline cable logging on the Fernow Experimental Forest. North. Logger 27(5): 20-32, illus.

The URUS skyline cable logging system was tested in West Virginia for about 2 years by the U.S. Forest Service. Results of these tests are summarized in this article.

504. Smith, H. Clay, and N. I. Lamson.
1977. Stand development 25 years after a 9.0-inch diameter-limit first cutting in Appalachian hardwoods. U.S. Dep. Agric. For. Serv. Res. Pap. NE-379. 4 p., illus.

This report is a case history of stand development 25 years after a 9.0-inch diameter-limit cutting in a primarily second growth 40- to 45-year-old Appalachian hardwood stand. Some old residual trees from the early 1900 logging era were scattered throughout the stand. In 1950, a 9.0-inch diameter-limit cutting removed 8,650 board feet per acre and reduced the basal area from 97 to 24 square feet per acre. Twenty-five years after this 1950 cutting, the total sawlog volume was 7,425 board feet per acre with a basal area of 98 square feet per acre. Oaks accounted for 42 percent of the sawlog-size trees and 45 percent of the sawlog stand volume.

505. Smith, H. Clay, and G. W. Wendel.
1976. Potential for strip-clearcutting in Appalachian hardwoods. W. Va. For. Notes 56: 16-19, illus.

Strip-clearcutting is a systematic method of clearcutting a forest. It is being evaluated on the Fernow Experimental Forest in West Virginia as an alternative to patch clearcutting. The strip-clearcutting method is potentially acceptable on aesthetic,

silvicultural, and stand-regulation grounds, and could be used for forest management in Appalachian hardwoods.

506. Smith, Christopher J.
1977. Visual and functional components of the built environment: A case study of urban residential neighborhoods. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 368-376.

The hypothesis that visual and functional characteristics of neighborhoods influence the psychological well-being of residents was tested. An informal test by a survey of advertising strategies for selling real estate was first used. Second, data from a variety of published sources were used to identify some of the underlying dimensions of residential neighborhoods. The dimensions were used as independent variables to predict three different measures of psychological well-being in former mental patients. The results partially supported the assumed relationship by demonstrating that neighborhood type appeared to influence the patients' recuperation.

507. Smith, D. E., A. L. Shigo, L. O. Safford, and R. Blanchard.
1976. Resistances to a pulsed electric current reveal differences between nonreleased, released, and released-fertilized paper birch trees. For. Sci. 22: 471-472.

A pulsed electric current was used to determine the resistance of cambial-zone tissues in pole-sized paper birch trees 3 years after thinning and fertilization treatments. Resistances in nonreleased (control) trees were significantly greater than those in released trees which had, in turn, resistances significantly greater than released fertilized trees.

508. Smith, Harvey R.
1977. Change in somatic growth rates of Microtus pennsylvanicus as a result of cross-fostering with Peromyscus leucopus. U.S. Dep. Agric. For. Serv. Res. Note NE-235. 4 p., illus.

A litter of five meadow voles (Microtus pennsylvanicus) was cross-fostered on a white-footed mouse (Peromyscus leucopus). All Microtus pups survived through weaning. Daily weight gain was 0.30 g before weaning and 0.96 g after weaning. When weaned, the Microtus pups were approximately 1/3 normal size for that stage of development. The timing of postnatal physiological events was not affected by cross-fostering.

509. Smith, Harvey R., and Robert W. Campbell.
1978. Woodland mammals and the gypsy moth. Am. For. 84(5): 22-24, 56, illus.

510. Smith, Harvey R., and George D. Whitney.
1977. Intraperitoneal transmitter implants--their biological feasibility for studying small mammals. In Proc. 1st Int. Conf. Wildl. Biotelemetry, Laramie, Wyoming, July 1977. p. 109-117.

The biological feasibility of intraperitoneal transmitter implants in small mammals was evaluated by studying survival of free-living Peromyscus leucopus from July 1975 to March 1976. Anticipated deleterious effects of peritoneal implantation did not occur. Overwintering survival was not reduced in transmitter-carrying animals. The advantages of intraperitoneal implants over subcutaneous implants or radio collars are discussed. The study concluded that peritoneal implants are not only feasible but biologically optimal.

511. Smith, James L., and Howard G. Halverson.
1976. Forest ecology. In McGraw-Hill yearbook of science and technology, 1976. McGraw-Hill Book Co. New York. p. 187-189.

Control of solar light and heat can help provide a proper growth environment for forests. Models were developed to predetermine the length and location of shadows at any time and for any location in the contiguous United States. Other model uses include a time sequence simulation of shadow presence at any point, given certain overstory conditions.

512. Smith, William H., and Leon S. Dochinger (eds.). 1976. Air pollution and metropolitan wood vegetation. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Stud. p. 1-74.

This report sets forth a program of research designed to achieve an acceptable level of understanding of the relationships between air contaminants and woody plants in the metropolitan northeast. Research needs are divided into categories of top and high priority for solving air pollution problems of forest and urban management in and around northeastern centers.

513. Snow, J. A., R. D. Schein, and W. J. Moroz. 1977. Characterization of biological particulate loads in metropolitan air. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 323-332.

The atmospheric particulate load includes a wide range of naturally occurring particles of biological origin that serve as a reservoir of allergenic agents in respiratory disease. Improved knowledge of potential aeroallergens is needed by medical clinicians. Aims are to better characterize air spora, qualitatively and quantitatively, and determine daily (by hour) periodicities of occurrence and prevalence of different kinds of spores, and seasonal variations. Main emphasis is on fungus spores about which least is known though they occur in considerable numbers. Efficient volumetric samplers provide time-related deposits of air spora at three sites in Pennsylvania.

514. Solomon, Dale S. 1977. Status of growth and yield information for northern forest types. In Proc. Symp. Intensive Culture of Northern Forest Types. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-29. p. 251-260.

Existing regional growth and yield information for most of the northern forest types is summarized by species. Present research is concentrated on growth-simulation models, constructed by either aggregating available

information or through individual tree growth studies. A uniformity of more refined measurements is needed so that future growth models can be tried for other species and forest types.

515. Solomon, Dale S.
1977. A growth model of natural and silviculturally treated stands of even-aged northern hardwoods. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-36. 30 p., illus.

A computer program simulates the development and treatment of even-aged northern hardwoods in New England. From the sapling stage, it projects stand growth to any rotation age or diameter, using available stocking guides, yield-table data, and gross growth estimates. Thinning and final harvest yields are presented by species and quality classes, and the effects of silvicultural treatments (or lack of treatments) on long-term stand response are incorporated.

516. Solomon, Dale S.
1977. The influence of stand density and structure on growth of northern hardwoods in New England. U.S. Dep. Agric. For. Serv. Res. Pap. NE-362. 13 p., illus.

Growth of northern hardwoods over a 10-year period was studied in plots that were treated to produce residual densities of 40, 60, 80, and 100 square feet of basal area per acre with stand structures of 30, 45, and 60 percent sawtimber. Both diameter and basal-area growth are tabulated by treatment and species.

517. Solomon, Dale S.
1977. Growth rates of northern hardwoods under uneven-age management. North.Logger 25(8): 18-38.

In a study of uneven-age management of northern hardwoods, components of average annual growth were calculated for residual stand densities of 40, 60, 80 and 100 square feet of basal area per acre, each having a range of stand structures of 30, 45, and 60 percent in

sawtimber-size trees. The treatment that maintained high-quality sawtimber production and acceptable sawtimber growth and balanced poletimber production was one that produced a residual stand of 80 square feet of basal area per acre, with 45 percent sawtimber-size trees.

518. Solomon, Dale S., and Barton M. Blum.
1977. Closure rates of yellow birch pruning wounds. Can. J. For. Res. 7: 120-124, illus.

In August 1963, 135 yellow birch trees (Betula alleghaniensis Britt.), averaging 5.08 cm in diameter at 1.37 m aboveground were pruned to two-thirds of their total height. Larger pruning wounds had a faster rate of closure but required more time to close than small wounds. The width and length of the pruning wound, as well as the diameter growth of the tree, were significantly related to closure rate. Although shade had no significant effect on closure rate, it reduced formation of epicormic branches.

519. Solomon, Dale S., and Barton M. Blum.
1977. Effects of pruning height on the diameter growth of yellow birch. U.S. Dep. Agric. For. Serv. Res. Note NE-233. 3 p., illus.

The diameter growth rate of pruned trees increased the second year after pruning, whereas the diameter growth of unpruned trees was not as fast during the second year. Diameter growth rate was positively correlated with the height to which all branches were pruned. After the pruning shock of the first year, trees pruned to 50 percent of their height showed the greatest cumulative growth in diameter.

520. Sopper, W. E., J. A. Lynch, and E. S. Corbett.
1976. Nature and magnitude of non-point source pollution from forests. In Proc. Workshop on Non-point Sources of Water Pollution: Problems, Policies, and Prospects. Purdue Water Resour. Center, Purdue Univ. p. 104-120.

Section 304 of the Federal Water Pollution Control Act (92-500) directs EPA to issue to the states guidelines for identifying and evaluating the nature and extent of non-point sources of pollution from "silvicultural activities". Information on the existing water quality of streamflow emerging from undisturbed forested areas and the natural variations that occur are presented. The relative impacts on water quality of various forest management practices conducted on experimental watersheds are given.

521. Sopper, W. E., J. A. Lynch, and E. S. Corbett (eds.). 1977. Water resources at the forest-urban interface. U.S. Dep. Agric. For. Serv. Pinchot Inst. Environ. For. Res. PA-2. 47 p.

A program of research designed to seek solutions for the more urgent problems related to urban water supply and wastewater disposal in the metropolitan Northeast is presented. Background information and research priorities are provided for 72 problem areas. The scope of the report ranges from the effects of timber harvesting, recreation, and land use changes on water quality to the effects of wastewater renovation by the forest ecosystem on public health, its socio-economic aspects and public acceptance.

522. Spencer, E. L., S. H. Surgenor, and R. E. Leonard. 1976. Backcountry research. The Mahoosuc Laboratory. Appalachia 41(8): 101-109.

The Mahoosuc Range is a well-defined geographic area encompassing a variety of ecological communities which, until recently, received little recreational use. Conditions are ideal for the establishment of an outdoor laboratory to study the interactions between recreationists and the backcountry. Baseline data on vegetation communities and existing trails is gathered for future comparisons. Methods for acquiring valuable use figures are self-registration, electric counters, and caretaker interviews. Water quality sampling and lysimeter tests are additional studies designed to evaluate human impact. AMC cost statistics are discussed briefly. The results of this research can provide a basis for knowledgeable management decisions.

523. Stark, Thomas F., and David R. Miller.
1977. Effect of synthetic surfaces and vegetation in urban areas on human energy balance and comfort. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 139-151.

524. Stern, E. George.
1977. Performance of lumber pallets of conventiona and improved designs. Va. Polytech. Inst. and State Univ., Wood Res. and Wood Constr. Lab. William H. Sardo, Jr. Pallet and Container Res. La Bull. 154. 36 p., illus.

Twenty-four randomly selected 52- by 42-inch mixed-hardwood warehouse and exchange pallets of old and improved designs were tested. The pallets of improved design had up to 20 percent higher stiffness, 21 percent higher rigidity, 25 to 30 percent lower bending resistance of stringers, and at least 10 times the resistance to impact of lift-truck forks. Pallets of improved design should have 78 percent longer life and a 44 percent lower cost per use.

525. Stern, E. George.
1978. Performance of warehouse and exchange pallets made of six western woods. Va. Polytech. Inst. and State Univ., Wood Res. and Wood Constr. Lab. William H. Sardo, Jr., Pallet and Container Res. Lab. Bull 156. 48 p., illus.

Fifty-seven 48 by 40-inch warehouse and exchange pallets of green or partially seasoned western hardwoods (Fremont cottonwood, California white and black oak, Oregon white oak, or bigleaf maple deckboards on Oregon white oak stringers) or western softwood (coast type Douglas-fir) were tested for stiffness, rigidity, and load-carrying capacity. Deflections of pallet centers after applying a 1000-pound concentrated load were less than 1/2 inch for all pallets. Nailed pallets were more rigid than stapled hardwood pallets. The average load-carrying capacity was 3,090 pounds for the hardwood and 2,025 pounds for the softwood pallets.

526. Steuer, Ralph E., and Albert T. Schuler.
1977. An interactive multi-objective linear programing approach to a problem in forest management. Oper. Res. J. 26(2): 254-269.

The major obstacle in applying previously developed mathematical programing procedures to multiple-use forest management has been the difficulty in assessing the appropriate criterion weights. An interactive multiple-objective linear programing approach, not requiring criterion weights, uses a combination of linear programing and vector-maximum technologies. At each interaction, the cone generated by the gradients of the multiple objectives is contracted. On the last two iterations, the most acceptable efficient extreme point is ultimately identified with the aid of a filtering device.

527. Stevens, Robert E., J. Wayne Brewer, and Daniel T. Jennings.
1978. Life history and habits of Coleotechnites edulicola (Gelechiidae), a pinyon needle miner in the Southwest. J. Lepidopterists' Soc. 32: 123-129.

528. Stevens, Robert E., and Daniel T. Jennings.
1977. Western pine-shoot borer: a threat to intensive management of ponderosa pine in the Rocky Mountain area and Southwest. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. RM-45, 8 p.

529. Summers, Peter W.
1977. Application of the urban mixing-depth concept to air-pollution problems. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 273-277.

A simple urban mixing-depth model is used to develop an indicator of downtown pollution concentrations based on emission strength, rural temperature lapse rate, wind speed, city heat input, and city size. It is shown that the mean annual downtown suspended particulate levels in Canadian cities are proportional to the

fifth root of the population. The implications of this and other results of the model are discussed.

530. Superfesky, Michael J., and George P. Williams.
1978. Shear strength of surface-mine spoils measured by triaxial and direct shear methods. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-39. 15 p.

Results of measurements of seven surface-mine spoils by triaxial and direct shear methods indicated that the direct shear method may be used for evaluating the shear strength parameters of surface-mine spoils. The average angle of internal friction determined by shear testing was 38.6°; the average value for the triaxial method was 33.4°. The average value of cohesion determined by direct shear testing of dry materials was .077 bar; the average value of cohesion determined for the triaxial method was .100 bar. Soaking specimens immediately before direct shear testing reduced the average angle of internal friction by 8.2°; there was no significant change in cohesion.

531. Surgeoner, Gordon A., and William E. Wallner.
1978. Evidence of prolonged diapause in prepupae of the variable oak leaf caterpillar, Heterocampa manteo. Environ. Entomol. 7: 186-188.

532. Surgeoner, Gordon A., and William A. Wallner.
1978. Foliage consumption by the variable oak leaf caterpillar, Heterocampa manteo (Lepidoptera: Notodontidae), its use in defoliation predictions. Can. Entomol. 110: 241-244.

533. Talerico, Robert L., Carlton M. Newton, and Harry T. Valentine.
1978. Pest-control decisions by decision-tree analysis. J. For. 76: 16-19, illus.

Pest-control decisions are often made under conditions of uncertainty and without consideration of all the alternatives. A decision-tree approach makes it

possible to determine the best alternatives without resolving the uncertainty. The method can be used to decide which of various control alternatives has the lowest expected cost.

534. Talerico, Robert L., John E. Walker, and Thomas E. Skratt.
1977. Progress toward quantifying insect defoliation with advanced photometric methods. Proc. 6th Bienn. Workshop Aerial Color Photogr. in the Plant Sci. and Related Fields. Colo. State Univ., Fort Collins. p. 60-71.

During 1975 and 1976 aerial photographs and satellite imagery were investigated as more objective ways to detect and delineate gypsy moth defoliation in central Pennsylvania. A camera photometric calibration technique and a new information extraction method, photometric interpretation, were used to analyze color infrared aerial film. A mathematical relationship was derived that relates ground defoliation estimates to a reflectance defoliation index. Several methods of displaying defoliation intensity including data from Landsat digital tape records, are demonstrated.

35. Talerico, R. L., J. E. Walker, T. A. Skratt.
1978. Quantifying gypsy moth defoliation. Photogramm. Eng. and Remote Sensing 44: 1385-1392, illus.

Currently, estimates of gypsy moth (Lymantria dispar (L.)) defoliation are subjective judgments of the amount of foliage that has been removed from a tree or a forested area. These estimates can be made by observers on the ground or in aircraft, or from aerial photographs. A precise, objective method for measuring and mapping insect defoliation from aerial photos is the use of color-infrared film (at a scale of 1:31,640) with the Scene Color Standard (scs) analysis. This photo-derived defoliation measure includes terms for IRR reflectance, green reflectance at maturity, and average red, green, and infrared reflectance of the crown. The correlation of measurements by the scs analysis with ground observations of

defoliation was R^2 = 0.78. scs technology also can be used in monitoring spray programs for uniformity of application and effectiveness in protecting foliage.

536. Talerico, Robert L., Robert W. Wilson, Jr.
1978. A sampling device for counting insect egg clusters and measuring vertical distribution of vegetation. U.S. Dep. Agric. For. Serv. Res. Note NE-250. 4 p., illus.

The use of a vertical sampling pole that delineates known volumes and position is illustrated and demonstrated for counting egg clusters of N. sertifer. The pole can also be used to estimate vertical and horizontal coverage, distribution or damage of vegetation or foliage.

537. Thomas, Jack Ward, Richard M. DeGraaf, and Joseph C. Mawson.
1977. Determination of habitat requirements for birds in suburban areas. U.S. Dep. Agric. For. Serv. Res. Pap. NE-357. 15 p.

Songbird populations were related to habitat components by a method that allows the simultaneous determination of habitat requirements for a variety of species. Through correlation and multiple-regression analysis, 10 bird species were studied in a suburban habitat, which was stratified according to human density. Variables used to account for bird distribution included aspects of vegetation, human activity, and structures.

538. Tignor, G. H., H. M. Mazzone, and R. E. Shope.
1976. Serologic studies with the baculoviruses of P. dispar and N. sertifer. In Proc. 1st Int. Colloq. Invertebr. Pathol. and 9th Annu. Meet. Soc. Invertebr. Pathol. (Queen's Univ., Kingston, Ont. Canada, 1976). p. 13-14.

Adult mice depleted of antibody cells by Cytoxan or by thymectomy were exposed to polyhedra of the nucleopolyhedrosis virus of P. dispar and N. sertifer by the following routes: oral intubation, foot pad

inoculation, nasal instillation, eye irritation, and feeding. In addition, guinea pigs whose depressed cell-mediated immune function was affected by cortisone were exposed to polyhedra of these viruses through applications to shaved backs, areas of intact skin, and areas on a single ear. No deleterious effects were observed from virus exposure, indicating that immuno-suppressed animals would not be infected by the viruses tested. In addition, strains of the viruses from various parts of the world were found, by the technique of complement fixation, to be serologically identical.

539. Timson, Floyd G.
1978. Develpoment of minimum standards for hardwoods used in producing underground coal mine timbers. U.S. Dep. Agric. For. Serv. Res. Note NE-261. 4 p., illus.

This note presents minimum standards for raw material used in the production of sawn, split, and round timbers for the underground mining industry. The standards are based on information gathered from many mine-timber producers.

540. Timson, Floyd G.
1978. Logging residue available for mine-timber production. U.S. Dep. Agric. For. Serv. Res. Pap. NE-415. 6 p., illus.

Hardwood logging residue was examined as a source of raw material in the manufacture of sawn, split, and round timbers for use in underground coal mines. Forty-four percent of the total logging residue (residue $\geq$ 4 inches in diameter outside bark (dob), small end, and 4 feet long) from sawlog-only harvests was suitable for mine-timber production. Only 26 percent of the limbwood residue was suitable for mine timbers, but 58 percent of the bolewood ranged from less than 40 percent (beech and basswood) to 68 percent (cucumber-tree).

541. Travers, Lawrence H.
1977. Perception of high-density living in Hong Kong. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 408-414.

Analysis of the Hong Kong experience of adaptation to urban living can provide insights into some of the problems that can be expected to occur in the rapidly expanding cities of the Third World. Population densities in Hong Kong are among the highest in the world, exceeding 400,000 persons per square mile in parts of Kowloon. Research based upon residence in a worker's dormitory and interviews with workers reveals a viariety of adaptive strategies employed by people to cope with the stress of the crowded urban environment. An understanding of the individual's ability to adjust to the stress of high-density living must consider the meaning of density as a concept in the culture in addition to social and cultural norms.

542. Trimble, George R., Jr.
1977. A history of the Fernow Experimental Forest and the Parsons Timber and Watershed Laboratory. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-28. 46 p., illus.

U.S. Forest Service timber-management research in West Virginia began in May 1934 when the Fernow Experimental Forest was established. Except for the war years in the 1940s, an ever-intensifying program of research has been carried out in both timber and watershed management. Lists of publications and personnel are appended.

543. Turner, Brian J., James C. Finley, and Neal P. Kingsley.
1977. How reliable are wood land owners' intentions? J. For. 75: 498-499.

Between surveys in 1970 and 1974, the proportion of Delaware landowners who said that they never planned to harvest timber remained constant (58 percent), but 35 percent of the individual owners had changed their minds about either harvesting or not harvesting. Forty-one percent were consistently opposed to harvesting, but they had only 15 percent of the state's

growing stock. Rates of change in intention and ownership suggest that eventually most of the growing stock will be harvested, although at any one time about a third of the total volume may be off the market.

544. Ungs, M., R. W. Cleary, L. Boersma, and S. Yingjajaval. 1977. The quantitative description of transfer of water and chemicals through soils. In Land as a waste management alternative. Raymond C. Loehr, ed., Ann Arbor Science Publishers, Inc. Ann Arbor, Mich. p. 109-137.

545. U.S. Forest Service. 1977. Recreational use of anthracite waste land in northeastern Pennsylvania: Suggestions for an evaluation and planning process. U.S. Dep. Agric. For. Serv. Unnumbered Misc. Publ., 112 p.

546. U. S. Forest Service. 1977. Outdoor recreation facilities in northeastern Pennsylvania 1976. U.S. Dep. Agric. For. Serv. Unnumbered Misc. Publ. (12 county booklets)

547. U.S. Forest Service. 1977. Posting in the Poconos. U.S. Dep. Agric. For. Serv. Inf. Bull. 36, 6 p.

548. U.S. Forest Service. 1978. Forest atlas of the Midwest. Robert W. Merz, compiler. U.S. Dep. Agric. For. Serv., North Cent. For. Exp. Stn., St. Paul, Minn., Northeast. For. Exp. Stn., Broomall, Pa., Coll. For., Univ. Minn., St. Paul. 48 p., illus.

Illustrates and describes the demographic, physiographic, edaphic, and climatic variables that comprise the forest environment of nine Midwestern states, and describes the important characteristics of the forests of these states.

549. Valentine, Harry T.
1978. Estimating defoliation of hardwoods using blade-petiole relations. U.S. Dep. Agric. For. Serv. Res. Pap. NE-405. 5 p.

Dimensional relations between blade weight and petiole thickness, and between blade area and petiole thickness are more useful in estimating defoliation when it occurs late in the growing season than when it occurs early in the growing season.

550. Valentine, Harry T., and Susan J. Hilton.
1977. Sampling oak foliage by the randomized-branch method. Can. J. For. Res. 7: 295-298, illus.

Foliage in mature Quercus spp. crowns was sampled by a two-phase procedure. The first phase provided estimates of the total count of leaf clusters in the tree crowns; the second-phase sample provided information about the clusters such as dry weight, surface area, and leaf count.

551. Van der Grinten, Martin, Brayton F. Wilson, and Burnell C. Fischer.
1977. Forest structure, composition, and vigor in housing developments. J. For. 75: 653-655.

552. Varma, Vishwa K.
1977. Use of the Delphi method for determining community growth goals inventory: the Nashville experience. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 432-437.

The author discusses the growth-inducing pressures on Nashville, Tennessee, describes the application of the Delphi technique to developing an inventory of the community's growth goals, and suggests that developing a list of community goals is a necessary first step toward growth management.

553. Viskanta, R., R. O. Johnson, and R. W. Bergstrom, Jr.
1977. Effect of urbanization on the thermal structure in the atmosphere. In Proc. Conf. Metrop. Phys. Evniron. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 62-76.

An unsteady two-diminsional transport model was used to study the short-term effects of urbanization and air pollution on the thermal structure in the urban atmosphere. A number of simulations for summer conditions representing the city of St. Louis were performed. The diurnal variation of the surface temperature and thermal structure are presented and the influences of various parameters are discussed.

554. Vogel, Willis G.
1977. Revegetation of surface-mined lands in the East. Proc. Soc. Am. For. 1977: 167-172.

Several species of hardwoods and pine planted 30 years ago have been reasonably successful on spoils in both the midwestern and Appalachian coal fields. Especially encouraging is the success of high-value hardwoods such as black walnut, red oak, tulip-poplar, and white pine. Many of the older strip-mined lands are also providing excellent wildlife habitat and water-based recreation. Currently, most surface mines are being revegetated with herbaceous species to provide quick erosion control. Tree planting has been discouraged by economic, legal, and social pressures. Establishment of both trees and herbaceous cover is feasible, especially by concurrent planting of tree seedlings and nonaggressive herbaceous legumes. A renewed interest in planting of woody species is needed to provide diversified uses of reclaimed land and to hasten the reestablishment of a forest ecosystem on reclaimed lands that are not consigned to other uses.

555. Vogel, Willis G., and Willie R. Curtis.
1978. Reclamation research on coal surface-mined lands in the humid East. In Reclamation of drastically disturbed lands. Am. Soc. Agron., Madison, Wis. p. 379-397.

A general overview of the results and application of some of the surface-mine reclamation research conducted on coal lands in the humid East, including revegetation, soil science, hydrology, geology, wildlife management, and engineering. Several bibliographies are cited that list most of the published information on mine reclamation research.

556. Wagar, J. Alan.
1977. Wildland recreation and resource management Proc. Wildland Recreation Conf. Banff, Alberta. Province of Alberta and Univ. Alberta. p. 11-19.

As the lead paper for the conference, outlines the nature and dimensions of wildland recreation, how other conference papers fit into a general model dealing with resource benefits, and how resource managers interface with political control of value choices.

557. Wagar, J. Alan.
1977. Resolving user conflicts. Proc. Wildland Recreation Conf. Banff, Alberta. Province of Alberta and Univ. Alberta. p. 133-145.

Reviews possibilities for technological fixes, allocation, substitution, information, and regulation as means of resolving conflicts and proposes a system of classifying and naming backcountry areas to reduce conflicts.

558. Wagar, J. Alan.
1977. Recreational carrying capacity. Proc. Wildland Recreation Conf. Banff, Alberta. Province of Alberta and Univ. Alberta. p. 168-175.

Outlines factors involved in setting use limits for recreation areas and the importance of treating each area as part of a system.

559. Wagar, J. Alan.
1977. The future and wildland recreation. Proc. Wildland Recreation Conf. Banff, Alberta. Province of Alberta and Univ. Alberta. p. 273-276.

Speculates on the effects of slowing growth, energy constraints, and likely population structure on the future of wildland recreation in Alberta.

560. Wagar, J. Alan.
1978. Why interpretation? Meeting the challenge. J. Interpretation 3(1): 6-10.

Environmental interpretation is readily justified as (1) enhancing human experiences and therefore contributing to sustained production of resource benefits and (2) helping people understand resource management alternatives, thereby contributing to responsible citizenship. Long-term prospects for interpreters are promising because the need for and potnetial benefits of interpretation are enormous and because interpreters are increasingly well trained, open to new ideas, and serious in dealing with both objectives and evaluation.

561. Walker, J. E., T. W. Gallagher, and J. Schott.
1977. Forest Damage Assessment System (FORDAS) study. U.S. Dep. Agric. For. Serv. Northeast. For. Exp. Stn. and Northeast. Area State and Priv. For. Unnumbered publ.

562. Wallin, W. B., E. G. Stern, and J. A. Johnson.
1977. Determination of flexural behavior of stringer-type pallets and skids. Va. Polytech. Inst. and State Univ. Wood Res. and Wood Constr. Lab. Pallet and Container Res. Cent. Publ. 146. 34 p.

Engineering principles are applied to the design of wooden pallets and skids with two to five stringers, in order to determine the flexural behavior of these assemblies under concentrated and uniformly distributed loads. Information is presented on principles of good pallet and skid construction. Formulae are advanced covering the strength and load-bearing capabilities of such pallets and skids.

563. Wallin, Walter B.
1977. Pallet strength computation. A simplified procedure. Va. Polytech. Inst. and State Univ. Wood Res. and Wood Constr. Lab. Pallet and Container Res. Cent. Publ. 151. 32 p.

Pallet manufacturers are continually faced with the problem of providing a product that is strong enough to perform the job, safe to use, and low in cost. This problem can be best resolved if the pallets are constructed in accordance with standard engineering principles which have been adopted for nearly all other types of wood structures. The technique provided here attempts to reduce rather complex design calculations to a series of tabulated values that may be multiplied together to select the best combinations of dimensions and materials to meet predetermined load and deflection requirements.

564. Wallner, William E.
1978. Scale insects: What the arboriculturist needs to know about them. J. Arboric. 4: 97-103, illus.

Scale insects are among the most damaging pests of shade trees and shrubs, yet they are poorly understood. This article summarizes information on the biology, feeding mechanism in relation to host damage, and control of the major scale groups.

565. Walters, Russell S.
1978. Vacuum transfer system increases sugar maple sap yield. U.S. Dep. Agric. Res. Note NE-264. 4 p., illus.

Yields of sugar maple sap collected from three plastic pipeline systems by gravity, vacuum pump, and a vacuum pump with a transfer tank were compared during 2 years in northern Vermont. The transfer system yielded 27 percent more sap one year and 17 percent more the next year. Higher vacuum levels at the tapholes were observed in the transfer systems.

566. Walters, Russell S.
1978. Tapholes drilled into frozen sugar maples close slowly. U.S. Dep. Agric. For. Serv. Res. Note NE-265. 4 p., illus.

Tapholes drilled into frozen maple tissues remain open longer than tapholes drilled into trees that have not frozen. Taphole closure was not affected by the speed of the tapper drill bit.

567. Walters, Russell S.
1978. Coniferous understory influences sugar maple (Acer saccharum Marsh.) sap production. U.S. Dep. Agric. For. Serv. Res. Pap. NE-398. 5 p., illus.

Sap and maple syrup production increased after a coniferous understory was removed from a sugarbush in northwest Vermont. These increases were 14 to 17 percent, respectively, and became apparent the 6th year after treatment.

568. Walters, Russell S., and Alex L. Shigo.
1978. Discolouration and decay associated with paraformaldehyde-treated tapholes in sugar maple. Can. J. For. Res. 8: 54-60, illus.

More decay (higher incidence and longer columns) was associated with sugar maple tapholes treated with paraformaldehyde than with control tapholes. This first became apparent 20 months after treatment. Discolored columns associated with pill-treated tapholes were longer than those associated with control tapholes for the first 8 months. After that time there was no statistically significant differences between column lengths associated with pill-treated and control tapholes. Cambial dieback occurred adjacent to many tapholes but there was no significant difference in closure rates of treated and control tapholes. The results indicate that repeated use of paraformaldehyde will lead to rapid development of decay in sugar maple trees.

569. Walters, Russell S., and Harry W. Yawney.
1978. Plastic tubing and maple syrup quality. U.S. Dep. Agric. For. Serv. Res. Pap. NE-409. 9 p., illus.

Daily maple syrup samples processed from sap collected using an improperly or carelessly installed plastic pipeline were more variable in grade and often of a lower grade than syrup from sap collected using a properly installed pipeline. Syrup samples of equal grade were produced from sap collected by the properly installed pipeline and by buckets.

570. Wargo, Philip M.
1977. Wound closure in sugar maple: Adverse effects of defoliation. Can. J. For. Res. 7: 410-414.

Twenty-three sugar maple trees that were defoliated by hand for 3 consecutive years and nine undefoliated tre were wounded with a drill bit in March 1974. After two full growing seasons, wound areas on defoliated trees were larger than those on undefoliated trees because of a more severe response by defoliated trees to wounding, and because of slower healing caused by smaller radial increment. More tissue died around the wounds on defoliated trees. There was no significant increase in internal discoloration, but decay was found in two defoliated trees. In undefoliated trees, wound closure was highly correlated with annual growth increment and resistance to pulsed electric current (ER). In defoliated trees, wound area was highly correlated with starch content of the roots.

571. Wargo, Philip M.
1977. Armillariella mellea and Agrilus bilineat and mortality of defoliated oak trees. For. Sci 23: 485-492, illus.

Dead, recently dead, dying, and living trees in areas defoliated by the gypsy moth, Lymantria dispar were examined for the presence of the shoe-string fungus Armillariella mellea and the two-lined chestnut borer Agrilus bilineatus. Root systems were excavated with front-end loader. A. mellea was established in the

roots of one-third of the living trees examined. Colonization on trees with healthy crowns was limited to one or several small roots. On trees with half-dead crowns, the fungus had extensively colonized the roots and on many trees was present at the root collar. Both A. mellea and A. bilineatus were present in dead, recently dead, and dying trees. The roots of most of the recently dead or dying trees were extensively colonized by A. mellea, even though the fungus was not visible at the root collar. It is proposed that oak mortality results from an interaction of A. mellea and A. bilineatus.

572. Wargo, Philip M.
1978. Correlations of leaf area with length and width measurements of leaves of black oak, white oak, and sugar maple. U.S. Dep. Agric. For. Serv. Res. Note NE-256. 3 p.

Correlations of leaf area with length, width, and length times width of leaves of black oak, white oak, and sugar maple were determined to see if length and/or width could be used as accurate estimators of leaf area. The correlation of length times width with leaf area was high ($r \geq + .95$) for all three species. The linear equation $Y = a + bX$, where X = length times width, can be used to estimate leaf area where it is not possible or practical to make actual area measurements.

573. Wargo, Philip M.
1978. Defoliation by the gypsy moth: How it hurts your tree. U.S. Dep. Agric. Gypsy Moth Handb., Home and Garden Bull. No. 223. 15 p.

Defoliation can be harmful to trees under certain conditions. The effects of defoliation depend on how much foliage was eaten, if the tree refoliated, how many years in succession the tree was defoliated, when during the growing season (early, middle, or late) defoliation occurred, what the weather conditions were after defoliation, if disease organisms and other insects attacked the tree, and how healthy or vigorous the tree was before defoliation.

574. Wargo, Philip M.
1978. Insects have defoliated my tree--now what's going to happen? J. Arboric. 4(8): 169-175, illus.

The effects of defoliation are not dependent on defoliation alone but on a complex interaction of many factors. The major influencing factors of severity, frequency, and timing of defoliation; growing conditions; secondary organisms; and tree vigor are discussed. Some of the adverse effects of defoliation are described and recommendations for preventing or lessening these effects are given.

575. Wartluft, Jeffrey L.
1977. Weights of small Appalachian hardwood trees and components. U.S. Dep. Agric. For. Serv. Res. Pap. NE-366. 4 p., illus.

Whole-tree weights, green and oven-dry, are shown in tables for Appalachian hardwood trees 1 to 10 inches dbh. Weights are also divided into tree portions greater than 3 inches and less than or equal to 3 inches in diameter. Information on species, moisture content, and percent bark accompany the weights. And metric conversior are provided.

576. Wells, O. O., P. E. Barnett, H. J. Derr, D. T. Funk, Timothy La Farge, E. R. Lawson, and Silas Little.
1978. Shortleaf X slash pine hybrids outperform parents in parts of the Southeast. South. J. Appl. For. 2(1): 28-32.

Hybrids were tested against their parent species for 10 years at 8 locations from New Jersey and Ohio to Louisiana. Certain hybrids performed better than either parent species in Georgia, Alabama, and Arkansas. However, shortleaf pine performed better than the hybrids in New Jersey and Ohio.

577. Wendel, G. W.
1977. Longevity of black cherry, wild grape, and sassafras seed in the forest floor. U.S. Dep. Agric. For. Serv. Res. Pap. NE-375. 6 p., illus.

The results of this study show that (1) black cherry seed remains viable in the forest floor for 3 years, with a small amount of seed germinating after 4 to 5 years; (2) sassafras seed remains viable for 5 years in the forest floor, and (3) some wild grape seed retains its viability for at least 8 years. These results are important to the forest manager in setting up harvest schedules and controlling unwanted species in the new stand.

578. Wendel, G. W., and J. N. Kochenderfer.
1978. Damage to residual hardwood stands caused by cable yarding with a standing skyline. South. J. Appl. For. 2(4): 121-125, illus.

Yarding logs with a standing skyline cable system in a partially-cut hardwood stand injured or destroyed about 7 percent of the residual stand--stems larger than 1.0 inch dbh. One tree per acre was abraded, 16 per acre were skinned (sapwood exposed), 2 per acre suffered root damage, and 15 per acre were destroyed. Results of this study were compared with published reports on tree injuries caused by cable yarding and skidding with crawler tractors and rubber-tired skidders in the eastern and western United States.

579. Whelan, J. B., K. I. Morris, R. F. Harlow, and H. S. Crawford.
1976. The bioenergetic approach to forest range management. Proc. 10th Northeast Deer Study Group, Yarmouth, Nova Scotia, Canada. September 1974. p. 28-43.

Dry matter production and digestible energy were determined on composite diets comprised of "key" deer food plants, collected during four seasons in a mixed oak-pine forest type in southwest Virginia. The ratios of total digestible energy avaiable in "key" forages to the energy required by the estimated deer population at a 50 percent forage utilization rate were 1.30, 2.98, 0.89, 0.91, and 0.56 (kcal/ha/da) for the spring flush, spring, summer, fall, and winter, respectively. These energy conversion ratios indicate the seasonal potential of the forest type to support the estimated population of 1 deer per 16.4 ha. A seasonal forage utilization rate

of 50 percent appears adequate for meeting the daily energy needs of the deer population during the spring flush and spring periods, however the 50 percent rate appears marginal for the summer and fall seasons and was inadequate for the winter season.

580. Wilkinson, Ronald C.
1977. Height growth performance of white spruce (Picea glauca (Moench) Voss) provenances in central Maine. Northeast. For. Tree Improv. Conf. Proc. 25: 87-93.

Height growth measurements were made in a range-wide geographic seed source test of white spruce on the Penobscot Experimental Forest, Bradley, Maine, after 10 and 15 growing seasons. After 15 years in the field, 14 of 24 seed-sources exceeded the plantation mean in height growth. Most of the fastest growing seed-sources are from the southeastern part of the range of white spruce. Trees from the more northern sources were poorly adapted to the planting site and had slow overall growth. The local source exceeded plantation mean height growth by 15 percent. Six other seed sources exceeded the mean by 18 to 32 percent. The six tallest seed-sources after 15 years were also the tallest at 10 years and among the 9 tallest at 5 years. Two sources, one from Beachburg, Ontario, and the other from north-central Michican, were 12 and 15 percent faster growing than the local source. Significant improvement could be made by simply introducing seed from these two sources into the region represented by the test plantation site.

581. Wilkinson, Ronald C.
1977. Inheritance of budbreak and correlation with early height growth in white spruce (Picea glauca) from New England. U.S. Dep. Agric. For. Ser. Res. Pap. NE-391. 5 p.

Variation in budbreak date among 37 half-sib families of white spruce in a replicated one-parent progeny test plantation in southern Maine was only 5 days. Differences in the mean data of budbreak between years were greater than those between families, but the genetic correlation between date of budbreak in different years was .661. Heritability estimates ranged from .228 to

.814, depending on the year and method of calculation. In each of 2 years, heritabilities estimated for family selection were higher than those for mass selection of individual trees in the planation.

582. Williamson, D., J. Fabos, and R. Brush.
1977. The visual screening potential of forest vegetation. Landscape Archit. Q. 68(1): 44.

583. Wilson, R. W., and G. A. Fontaine.
1978. Gypsy moth egg-mass sampling with fixed and variable-radius plots. U.S. Dep. Agric. Handb. 523.

584. Woch, W.
1976. Cell events in cambium connected with the formation and existence of a whirled cell arrangement. Acta Soc. Bot. Pol. 45: 313-326.

Tumorous areas in otherwise normal wood of Picea and other conifers result from local areas of cambium having a much higher than normal rate of non-randomly oriented anticlinal cell divisions and also a very high rate of intrusive growth. This study provides a method of pinpointing the initial event in time and space. Thus the cause of tumor induction may be deduced.

585. Wolf, Charles H.
1977. Wage differentials among Appalachian sawmills. U.S. Dep. Agric. For. Serv. Res. Note NE-237. 5 p.

Wage differences among Appalachian sawmills were investigated, using multiple-regression analysis. Wages and fringe benefits were found to vary with type of product sawed, education of the work force, distance to urban areas, general wage levels, and use of collective-bargaining agreements between management and labor.

586. Wolf, Charles H.
1977. Job-quitting at Appalachian sawmills. U.S. Dep. Agric. For. Serv. Res. Pap. NE-369. 10 p., illus.

The author investigated the rate, causes, and control of employee turnover in Appalachian sawmills. In the typical mill surveyed, the number of workers who quit annually was about equal to the mill's average employment. Variation in quit rates was associated with the age of the workers, the wages and number of holidays they received, and the general wage level and unemployment rate in local labor markets.

587. Wolf, Charles H., and Jean W. Nolley.
1977. Changes in the logging labor force. U.S. Dep. Agric. For. Serv. Res. Pap. NE-359. 7 p., illus.

Employment in the logging industry dropped 28 percent between 1950 and 1970, while output of industrial roundwood increased 31 percent. Today's loggers are older, better educated, and more skilled. A large proportion are self-employed, many work less than a full year, and a substantial number have incomes below the poverty level. Mechanization of timber harvesting will continue to affect the size and makeup of the labor force.

588. Wollam, John D., William G. Yendol, and Franklin B. Lewis.
1978. Evaluation of aerially-applied nuclear polyhedrosis virus for suppression of the gypsy moth, Lymantria dispar L. U.S. Dep. Agric. For. Serv. Res. Pap. NE-396. 8 p. illus.

Single and double applications of the nuclear polyhedrosis virus of Lymantria dispar resulted in foliage protection, population reduction, and increased numbers of virus-infected hosts. Second generation larval emergence was significantly lower in treated areas than in untreated populations.

589. Yap, D.
1977. A preliminary investigation of the nocturnal temperature structure above the city of Edmonton, Alberta. In Proc. Conf. Metrop. Phys. Environ. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. NE-25. p. 77-87.

Information about the nocturnal temperature structure over Edmonton, Alberta. Observations of the temperature fields, including two- and three-dimensional forms of the nocturnal heat island, were obtained from minisonde ascents, an instrumented helicopter, and towers during a 3-week urban air-pollution field study. Results show that urban-induced temperature modification is typically in the lowest 100 m above ground. Along the direction of the prevailing wind, there is a progressive modification of very stable upwind air as it flows toward the city center, the urban air being less stable. Implications of these observed features on urban air pollution are discussed.

590. Yawney, Harry W.
1977. Why vacuum pumping increases sap production. Natl. Maple Syrup Dig. 16(1): 20-23.

Under normal conditions, sap from sugar maple trees flows from tapholes when pressures inside the trees are higher than atmospheric pressure. Vacuum pumping has the effect of lowering the atmospheric pressure within a closed plastic tubing system. As a result, vacuum pumps will produce sap on days when sap ordinarily would not run, and also increase sapflow during normal flow periods.

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Northeastern Forest Experiment Station.
1979. 1977-1978 Report. Northeast. For. Exp. Stn., Broomall, Pa.
206 p. (USDA For. Serv. Gen. Tech. Rep. NE-50)

A summary report on highlights of research activities and accomplishments of the Experiment Station in 1977 and 1978, including an annotated list of publications.

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Headquarters of the Northeastern Forest Experiment Station are in Broomall, Pa. Field laboratories and research units are maintained at:

- Beltsville, Maryland.
- Berea, Kentucky, in cooperation with Berea College.
- Burlington, Vermont, in cooperation with the University of Vermont.
- Delaware, Ohio.
- Durham, New Hampshire, in cooperation with the University of New Hampshire.
- Hamden, Connecticut, in cooperation with Yale University.
- Kingston, Pennsylvania.
- Morgantown, West Virginia, in cooperation with West Virginia University, Morgantown.
- Orono, Maine, in cooperation with the University of Maine, Orono.
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- University Park, Pennsylvania.
- Warren, Pennsylvania.