It's what reliable four-season spray programs are built on.

The cool, humid weather that encourages the development and growth of dollarspot, leafspot and melting-out in the spring also encourages their spread in the fall. Regular applications of Acti-dione TGF® on tees, greens, and fairways control diseases that are potential problems in autumn.

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Industry News

Cushman-Ryan training program offered again

More than 200 persons are expected to graduate this fall and winter from Cushman-Ryan's factory service training network.

Ivan Vagts, national service manager, said the 1977-78 curriculum includes 21 classes offered on a rotating basis in four cities. The specialized 2½-day classes are available to both Cushman-Ryan customers and dealer mechanics.

"We pioneered the factory service training network last year and were pleased with results," Vagts remarked. "So this year we've expanded our program."

Centers will be located in Atlanta, San Francisco, Lincoln, Nebraska, and Fairfield, N.J. The classes, which are scheduled to begin in November and run through January, will be conducted on a rotating basis.

Ryan classes will spotlight the aerification product line plus sod cutter equipment. The Cushman program includes comprehensive classes on engine repair and the drive train assembly.

Vagts said registration forms are available by contacting him or any Cushman-Ryan dealer. He suggested applicants select a first and second choice of attendance dates.

U.S. sulfur-coated urea facility planned

The first sulfur-coated urea facility in the U.S., and the second in the world, will be built in Columbia, Ga. by Ag Industries Manufacturing (AIM) Corporation, a subsidiary of Lakeshore Equipment and Supply Company, licensed through the Tennessee Valley Authority (TVA) under several patents. Construction of the plant's process equipment will begin after ribbon-cutting ceremonies scheduled for mid-October with plans for operation in early 1978.

TVA has been testing sulfur as a coating for urea since 1957 at the National Fertilizer Development Center in Muscle Shoals, Alabama.

Although test results were promising, conditions in the U.S. didn't favor large-scale marketing of the product until recently, according to Ronald A. Smith, project manager for Lakeshore. The method TVA licensed AIM to use took about 15 years to develop.

Currently, the only commercial plant in operation is in Canada, but there are pilot plants located at Muscle Shoals, Korea, Spain, and England, and the product is showing great international acceptance.

Covar fescue released for erosion control

Covar, a new grass that grows well in the dry regions of the Pacific Northwest, is expected to be used extensively to control erosion on rangeland, roadsides, ditchbanks and other sites.

Covar, a variety of sheep fescue, was developed at Washington State University and is being released jointly by WSU, the University of Idaho, Oregon State University, and the U.S. Department of Agriculture's Soil Conservation Service.

As a ground cover, the fescue grass tends to crowd out weeds. When seeded with other grasses, Covar controls erosion on steep rangeland and provides early spring forage for cattle.

Covar is adapted to most of the Pacific Northwest east of the Cascades and grows well in regions with 10 to 18 inches of rainfall.

Scientists at NCSU will study CO_2 loss

Scientists at the North Carolina State University Agricultural Experiment Station will study a complex and little understood plant phenomenon known as postillumination burst of carbon dioxide. The study will be done under a memorandum of understanding with the U.S. Department of Agriculture. Postillumination burst of carbon dioxide is the sudden release of substantial amounts of carbon dioxide by plant leaves when light is turned off. This loss of carbon dioxide, required for plant growth, may have undesirable effects on plant growth and yield. Knowledge about this plant phenomenon will help plant breeders to develop new improved varieties.

The two-and-a-half-year, $36,000 research project will be funded by USDA's Agricultural Research Service (ARS).

Dr. T. E. Wynn will be the principal investigator for the experiment station. Dr. D. E. Moreland is the sponsoring scientist for ARS.

Pennfine produced under federal act

Pennfine ryegrass, developed at The Pennsylvania State University, has become the first Penn State variety produced under the new federal Plant Variety Protection Act.

The new law stipulates that seed growers wishing to produce a new variety may do so under a contract wherein the growers must meet regulations for quality seed as set by the breeder (Penn State).

The law thus provides for proprietary ownership, wherein an individual or organizaion owns and controls a variety. In this way, the contract assures the breeder that seed will have the superior qualities originally built into the new variety, according to Dr. Joseph M. Duich, developer of Pennfine ryegrass.

The Seed Production and Introduction Corporation (SPIC) is handling all contractual arrangements for producing Pennfine ryegrass. Already, four competing national seed companies are producing Pennfine under contract with SPIC.

From a Bird's Eye View

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People on the Move

Donald E. MacKenzie has been appointed OSHA's field coordinator. He will be responsible for coordination of the agency's field programs and directives and will represent the interests of regional administrators in the development of program plans and policies. MacKenzie served as OSHA's regional administrator in Atlanta for more than three years and was regional administrator in Boston.

Dr. Edward C. Kostansek has been appointed research chemist in the Industrial Products Research group at the Minerals & Chemicals Division of Engelhard Minerals & Chemicals Corporation. A recent graduate of Harvard University, Kostansek completed his Ph.D. dissertation under Professor W. N. Lipscomb, the 1976 Nobel Laureate in chemistry.

Chevron Chemical Company has appointed **Stanley Kane** as plant manager of the Ortho Pesticide and Insecticide Plant in Maryland Heights, Missouri. He replaces P. G. Curnutte, who retires after more than 27 years with the company. Kane will be in charge of the midwest production facilities.

Five new members have been appointed to the Department's National Advisory Committee on Occupational Safety and Health (NACOSH). They are: **Don B. Chaffin,** professor, Department of Industrial and Operations Engineering, University of Michigan, **Ernest M. Dixon,** Corporate Medical Director, Celanese Corporation, **Andrea Hricko,** Health Coordinator, Institute of Industrial Relations, University of California, **Marcus M. Key,** School of Public Health, University of Texas, and **Claudia Miller,** private consultant, Chicago. **George H. R. Taylor,** executive secretary of the AFL-CIO's standing committee on occupational safety and health, has been reappointed to a fourth term.

Dr. Peter J. Schultz has been promoted to the position of Chief Environmental Scientist of J I Case Company. He will ensure that the company's worldwide environmental needs are being pursued aggressively. Schultz joined Case in 1972 as an environmental chemist at the Corporate Test Center in Racine.

Dr. David W. Pritchard has joined Stauffer Chemical Company as product manager-herbigation specialist, a newly established position created to deal with the various aspects of pesticide application through irrigation systems.

Cantu

Mazza

McCloskey

McLaughlin

Sullivan

David T. McLaughlin was elected chairman of the Board of Directors of the Toro Company. President of Toro since 1970, he will continue as chief executive officer. **John J. Cantu** has been named a director and president of the Minneapolis-based manufacturer.

Dennis V. McCloskey is Chairman of the 1978 103rd Convention of the American Association of Nurserymen. President of Windmill Nurseries of Franklinton, La., he has been a member of AAN since 1971, has served on the Association's Horticultural Standards Committee and has represented the Louisiana Chapter at previous conventions as both Lt. Governor and Governor. McCloskey also served on the Board of Directors of the Southern Nurserymen's Association.

Velsicol Chemical Corporation has announced the promotion of **Vincent Mazza** to Director of Marketing, Agricultural Business Group. His responsibilities include advertising, promotion, merchandising and market planning for Velsicol's chemicals in agriculture, industrial brush control, pest control and home, lawn and garden. Mazza began his career with Velsicol in 1959.

James M. Sullivan has been appointed advertising manager for the Industrial Divisions of Johns-Manville Sales. He is responsible for the advertising and sales promotion of all Johns-Manville industrial specialty items. Sullivan joined the firm in 1972.

Top management changes at Hercules were approved by the company's Board of Directors. **Alexander F. Giacco,** executive vice president and chief operation officer, is president, chief executive officer and chairman of the executive committee. **Werner C. Brown,** president since 1970, is chairman of the Board of Directors. **John M. Martin,** chairman since 1970, is honorary chairman and will remain an active Board member until his retirement in January of 1978.

MANHATTAN

Perennial Ryegrass

School grounds in St. Paul, Oregon gets plenty of traffic but still looks great.

Manhattan **fairways** at Elkhorn Valley Golf Course, Mehama, Oregon. Imparts beauty and wear tolerance to this mountain course.

Manhattan Perennial Ryegrass has those desirable characteristics long sought in a turf grass.
Consider these data facts in your turf program:

- Superior fast establishment.
- Long term performance.
- Depth of crown assures better recovery from turf damage, greater wear tolerance, holds better under short mowing.
- Good density . . . more competitive with unwanted weeds and grasses.
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- Dark green color.
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Manhattan fine leaf perennial ryegrass is the versatile grass. Excellent for golf tees and fairways, parks and athletic fields, home lawns. Developed at Rutgers University, New Brunswick, New Jersey, grown in Oregon under rigid certification and quality control.

Home lawn near Woodburn, Oregon after three years in 100% Manhattan.

Sprague **football stadium**, Salem, Oregon holds up well even in the soaking rains of Oregon's fall months.

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Disease Stresses of Urban Trees

By

E. B. Himelick

Survival of trees in today's cities emphasize their tenacity and ability to adapt. Not only do they survive weather, insects and disease, but they manage to survive man's machinery, concrete and soil disturbances.

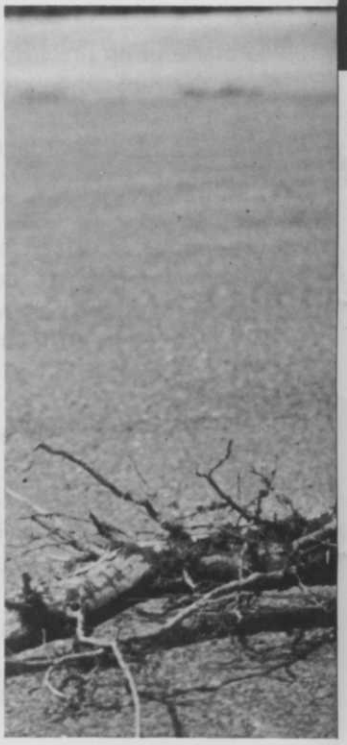
Even native tree species may be regarded as exotic when planted along streets and around homes, because of the many unnatural environmental stresses placed on them. The effects of clay fill, soil compaction, rapid runoff of water and the reflected heat from buildings are compounded by natural hazards.

The total effect of all stresses determines the vigor and ultimate survival of all plants. The evaluation of all potential stress factors must be considered in the selection of tree species for future planting.

Noninfectious Diseases

Environmental Stresses

Of all the stresses related to climate, prolonged dry periods and soil-water deficiencies have the greatest effect on the amount of growth a tree produces each year. The cambium growth either slows down or completely stops, depending upon the amount of available soil moisture. Drought will not only affect growth during the current growing season but can affect growth in later years. A summer drought affects the number of leaf



Feathery water sprout growth resulting from topping or dehorning as commonly practiced in some areas of the country.

initials formed in new buds, which produce shoot growth in the following year. A reduction in both the number and size of leaves directly affects the amount of carbohydrates and hormones produced the following year.

Frequently, tree declines are associated with excessive soil moisture, due to excessive rainfall, and with prolonged drought periods. Decline and permanent damage to the root system usually results. Some of the major diebacks and declines resulting from too much or too little moisture are birch, sweetgum, maple and ash dieback and oak and sycamore decline.

Other Stress Factors

Low-Temperature Injury

Plant tissues may be injured when temperatures drop near or below freezing. Freezing conditions following a gradual drop in temperature are seldom harmful to most trees after they have started to go dormant in the fall. However, a rapid drop in temperature following a period of mild weather can cause extensive damage. Trees exposed to winds or direct sunlight are more likely to be injured than those in sheltered locations. Low-temperature injury usually occurs on species planted outside their natural range, especially those moved from a mild climate to a severe climate.

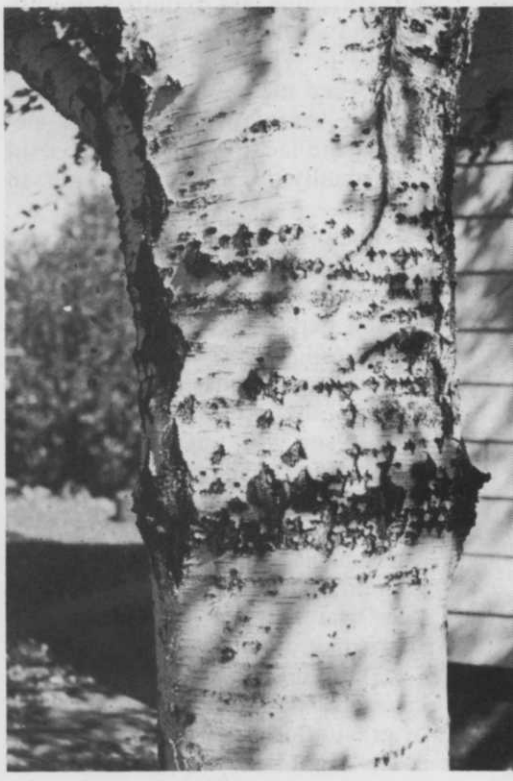
A sudden drop in temperature following a warm autumn may cause the death of plant tissues that are not mature enough to withstand freezing conditions. The injured tissue is often confined to succulent shoot growth that is still internally active beyond the point of normal growth cessation. Terminal dieback will become evident the following spring.

Low-temperature injury during the winter dormant season affects the roots, trunk bark, twigs, and vegetative and flower buds. This injury occurs following abnormal warm periods during the winter months. Poor drainage, the genetic character of the root system, lack of snow cover and soil type are other factors that contribute to root injury during the dormant period.

Frost cracks on trees are caused by the expansion and shrinkage of bark and wood, which cause internal mechanical stress and result in the cracking or splitting of the wood and slipping of bark at the cambium layer. Tree species commonly affected by frost cracks are London

Root decline associated with wet, poorly drained soil. All photos courtesy of Illinois Natural History Survey.

Mechanical girdling by a wire.



Sapsucker injury on white birch.

plane, oak, elm, maple, horse-chestnut, linden, tuliptree (yellow-poplar), and willow. Frost cracks on London plane trees often reopen when the air temperature falls to 8°F and remain open until temperatures warm in late winter. Usually these cracks never close completely, making entrance easy for insects and woodrotting fungi and eventually causing deterioration of the heartwood.

Frost-heaving many times affects newly planted trees. Ice formation in the friable soil around and under new trees often displaces or heaves the tree and causes root damage. Displaced trees lean and the displaced root systems do not settle to their original levels.

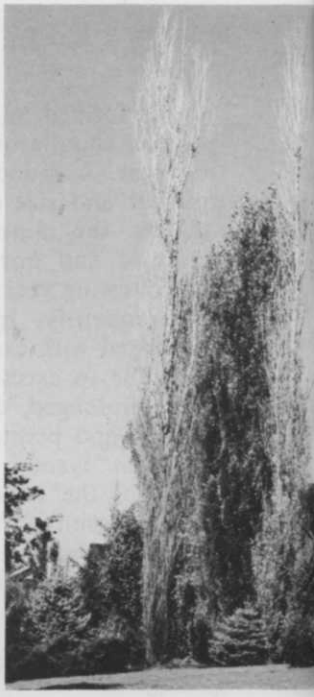
Soil Nutrient Deficiencies and Soil Pollution

Of the 16 nutrient elements commonly required for normal tree growth, nine are required in substantial amounts and seven are required in relatively small amounts. Abnormal metabolism may result if one or more of the essential elements are lacking, or if they are in abnormally high concentration in the soil.

Factors that regulate the amount of nutrients absorbed by tree roots are concentration of the nutrients, topsoil depth, texture and structure of the soil, type of subsoil, soil pH, and soil compaction. The greater the depth of the topsoil, the greater volume of soil with physical, chemical, and biological characteristics favorable for root growths. Soil texture and structure affect the water-holding capacity, aeration and nutrient content. Heavy clay soils afford poor water drainage, aeration and nutrient availability.

The subsoil is important becauase of its effect on the drainage of gravitational water from the topsoil. A tight heavy subsoil will cause frequent waterlogging of the topsoil during rainy periods. Soil compaction affects aeration and water infiltration into, and percolation through, the topsoil. Root penetration and development are poor in heavy, compacted, poorly drained soils.

Soils in urban areas, particularly along streets and around homes are often excellent examples of poor soil conservation and management. The refuse left from basements, foundations, storm sewers and water- and gas-line excavations is usually spread over the surface. This type of deep subsoil is often heavy clay, variable in nutrients, and low or lacking in organic matter. It usually contains limited amounts of both nitrogen and potassium and can be deficient in several of the other essential elements.



Sycamore decline believed caused by water stress and a canker disease.

The nutrient most often lacking in plant growth is nitrogen. There is considerable evidence that under natural conditions most of the nitrogen in the soil accumulates in organic forms from the biological fixation of atmospheric nitrogen. The bulk of the nitrogen absorbed from the soil by plants is stored in decomposed plant material. Microorganisms in the soil must break down plant material into simple inorganic components before the nutrients are re-used by trees. When nitrogen is lacking, it causes pale green foliage, stunted top growth, and yellowing or drying of the older leaves, especially during droughts. Good fall color on maple, oak, and many other tree species is often an indication of nitrogen deficiency and general poor vigor. Maples and oaks that have been fertilized in the spring, and given supplemental watering during dry periods, usually remain green longer in the fall and do not develop good fall coloration.

Chlorosis occurs on several tree species due to the lack of iron, manganese, magnesium, boron, and zinc. The most common deficiency of pin oak, sweetgum, maple, baldcypress, hackberry, white oak, and several other deciduous or evergreen species is the lack of iron or manganese.

Symptoms of iron chlorosis develop on pin oak when the soil pH is 6.7 to slightly more than 7.0. Many pin oaks appear normal for years when not disturbed by construction or other soil disturbance. Lawn fertilization and watering with city water often change the soil pH after a few years. Many fertilizers contain large amounts of calcium carbonate. Although this chemical

Numerous trees in a screen planting dying from Cytospora canker. Useful life expectancy is sometimes less than 10 years.

Pin oak chlorosis is a serious problem in soils with high pH.

does move slowly through the soil, frequent applications of calcium carbonate over the years will change the soil pH.

Some pin oaks growing in nursery rows and along streets remain a normal green color, while many others become chlorotic. This variation among pin oaks suggests that some genetic difference may occur and that it may be possible to select cultivars tolerant of high pH.

Stress Caused by Air and Soil Pollution

It has been estimated that more than 50 percent of the American population live in areas of constant air pollution. All urban trees are living in constant soil or air pollution of one type or another.

Gaseous air pollutants, such as SO_2, halogen compounds, ozone, ethylene gas, and nitrogen oxides cause visible foliage injury to different tree species.

Natural pollutants such as hydrocarbons from the conifers, methane gas from the marshes, hydrogen sulfide from decaying vegetation, air-borne soil particles, pollen, fungus spores, volcanic dust, and radiation have been in existence during the evolution of trees. For thousands of years, tree species have been naturally selected for surviving the environmental stresses caused by these pollutants.

Published reports indicate that 2,4-D and 2,4,5-T may cause extensive injury to foliage due to aerial drift of the spray and to volatile materials that evolve after application. Much of the injury was believed to result from improper application and former use of highly volatile forms of the herbicides.

Visible chemical injury on non-target plants is evident each year, and in 1975 over 10 percent of the tree and shrub specimens sent to the diagnostic laboratory of the Illinois Natural History Survey showed definite symptoms of chemical injury. A high percentage of the chemical injury resulted from the use of weed killers such as 2,4-D in lawn fertilizers and from surface spray applications. Much of the damage is apparently caused by applications that create fine particles easily carried by air movement to non-target plants.

Vascular Wilt Diseases

Oak wilt has caused loss of some oak trees in suburban areas of the Midwest where new homes have been constructed in stands of native oak. The recreational value of some parks and forest preserves has been lost due to the loss of oaks. Oak wilt is known to affect all species of oaks, but it is most serious among species of the red oak group. Oaks in urban areas do not appear to be threatened by this disease.

Many trees and shrubs are affected by Verticillium wilt, a vascular fungus disease. It is the only vascular disease that affects such a wide variety of unrelated annual and perennial plants. The disease is rare in forest stands but is becoming increasingly prevalent in ornamental plantings, especially in temperate regions of the world. Presently, 60 tree and shrub species and varieties are know to be susceptible. Symptoms can be difficult to diagnose on some of the less susceptible tree species. Trees weakened by the dis-

ease, because of the death of portions of the root system, may be more susceptible to the effects of other stress factors.

Leaf Diseases

Spray control is usually recommended for most leaf diseases to prevent loss in foliage and ornamental appearance. Loss of ornamental effect is often temporary, but loss of foliage, if severe, may have a long-term effect. Synthesis, movement, and storage of food reserves is lowered even in vigorously growing trees. Older and less vigorous, slower-growing trees are more seriously affected, since the decrease in growth is often greater the following year. Awareness of the disease susceptibility of various tree species to leaf diseases will permit proper timing of effective fungicide sprays. Improper timing of spray applications may make them worthless and expensive in time and money. Few leaf and canker diseases, except powdery mildew and scab, can be eradicated by fungicide spraying. Several leaf diseases are erratic in their severity and usually are important if heavy defoliation occurs early in the growing season for two or three consecutive years. Often it is more practical to apply water during drought periods than to spray. Unless trees are low in vigor, they will usually respond well to applications of fertilizer in the spring and supplemental watering during dry periods of the summer.

Control of Infectious Tree Diseases

There are at least four major concepts of control for infectious tree diseases: exclusion, eradication, protection, and resistance. Each of these control procedures is important in limiting tree loss from infectious diseases.

Exclusion

Exclusion refers to control procedures that prevent the movement of plant pathogens or disease agents into areas where they are not known to exist. Seeds and vegetative parts used for reproductive purposes are often treated to prevent the introduction of undesirable organisms into new areas. When symptoms or other signs of infectious organisms are present, the infected plant material can be culled. Disease agents, such as viruses in the seed or other plant material, are easily transmitted in plant material used for propagation and, therefore, are difficult to control. Nursery inspections for certification and state quarantines have been effective in limiting the movement of certain insects and diseases to new areas of the country. United States quarantines are adopted to control the importing and exporting of plant materials, and these materials are subject to inspection and in some cases fumigation before they are shipped.

Eradication

Activities associated with remov-

Before Dutch elm disease, shade and trees covered the landscape. After Dutch elm disease, or any devastating tree disease, we must start over.