

# ROAD SALT DAMAGE AND TOLERANT GRASSES

By William R. Kennedy  
Research Editor  
University of Wisconsin-Madison

Landscape plants do well preparing themselves for winter. They develop a reduced metabolism and begin living off of stored reserves. Most of the competitors of plants lie dormant also during the winter months, assuring that both will start on an even keel at spring's outset.

There is one enemy of plants though that works exclusively in winter, the street and highway snow removal crews. Their use of salt in deicing roads leads to serious alteration of a plant's biota. And, if the landscape industry doesn't solve this salinity problem, there'll be fewer landscaped medians, fewer contracts and more medians and roadside areas covered with blacktop and concrete.

Paul Drolsom and Lou Grueb of the University of Wisconsin have been conducting a study to examine the effects of salinity on plants and soils. They've hit upon some interesting reasons for the adverse effects and are working at identifying and developing varieties that resist high salt levels.

Road salt, principally sodium chloride, can move to the surrounding roadside in a number of ways. It can fall on neighboring soil directly from the salt truck, through brine splash or runoff. Salt can also be kicked off the road by passing vehicles or recrystallize and form a fine white powder that is easily scattered by the wind. A highway industry study showed that half of the salt applied to pavement is carried away only hours after application either on the vehicles themselves or through brine splash and crystal movement.

All this salt laying on the soil and plants neighboring roadways affects the plant biota in many ways.

The soil structure, a basis for fertility, drainage and ultimately plant survival, is drastically altered by salt. Excessive sodium (Na) levels in the soil reduce the cation exchange capacity. Simply, reduced cation exchange sites create a tighter soil that results in poor drainage. Also fewer exchange sites prevent other nutrients from bonding in the soil and making it more difficult for the plant to get the nutrients it needs.

"The high salt levels also create drought conditions for the plant by increasing the osmotic potential of the soil solution according to Grueb. This means simply that more water is tightly retained in the soil structure rather than being made available to plants. This drought stress is especially a problem in dry years.

High sodium levels cause havoc in a number of ways, but the chloride ions "cause greater direct damage to more species of plants adds Drolsom. "We're not sure in what ways the chloride is toxic, but we do know later stages of chloride toxicity are manifested in burning and firing of leaf tips and margins, bronzing, yellowing, premature leaf abscission and sometimes chlorosis" according to a Pennsylvania study.

## Grasses With High Road Salt Tolerance

Alkali Socrat	Rescuegrass
Inland Saltgrass	Canada Wildrye
Nuttall Alkaligrass	Western Wheatgrass
Bermudagrass	Tall Fescue
Tall Wheatgrass	Barley
Rhodesgrass	<i>Puccinellia distans</i>

Landscapers can protect themselves from excessive salt problems by planting salt tolerant grass species. Most salt tolerant species are native to the western U.S. alkaline soils. Some of these grasses do not persevere in the harsh winter cold of the areas that demand the salt applications for road safety.

One grass that appears to overcome this problem is *Puccinellia distans* or alkali grass. This grass which is native to western Nebraska and Alaska may have the best potential for use in the upper midwest. The grass was observed growing naturally in the salt contaminated soils along the interstate highways surrounding Chicago according to University of Wisconsin researcher Robert Newman.

The old standby in cool climates, Kentucky blue, has low tolerance to salt even though Fylking, a cultivar of Danish origin was slightly more tolerant than common, Merion or Windsor Kentucky blue.

The following list of grasses shows grasses with good tolerance of high salt levels. The list will be helpful if you land a job landscaping a road right of way or homes along busy thoroughfares. Alkali socrat; Inland saltgrass; Nuttall alkaligrass; Bermudagrass; Tall wheatgrass; Rhodesgrass; Rescuegrass; Canada Wildrye; Western wheatgrass; Tall fescue; Barley; plus *P. distans* which is sometimes improperly identified as Nuttall alkaligrass.

WTT

# FOLIAR ADSORPTION FACTORS OF PHOSPHOROUS AND RUBIDIUM

By David W. Reed and Harold B. Tukey, Jr., Department of Floriculture and Ornamental Horticulture, Cornell University, Ithaca, New York.

Foliar nutrition can offer a more efficient, economical and rapid method of supplying nutrient material to plants than conventional soil application. There is renewed interest in foliar nutrition due to the current high cost of fertilizer and concerns about environmental pollution by leaching and run-off from ground application. As a result, the Horticultural Research Institute (HRI) is helping to support this valuable research.

Foliar absorption of phosphorous (P) compounds has been studied extensively because smaller quantities of P are easily fixed and thus not available for plant use. Results of experiments studying various P compounds and factors affecting their foliar absorption have been highly variable, however. Despite the potential benefits, supplying P in foliar sprays is not practiced widely. pH of the treating solution, which determines the chemical form of P present in it, is one of the principal factors affecting foliar absorption of P. In addition, pH may alter the permeability of the cuticle, generally considered the foliar absorption rate-limiting barrier.

Work was initiated to better define the effect of pH of the treating solution on foliar absorption of phosphorous and rubidium compounds and to determine the factors affecting foliar absorption with possible adaptation to commercial applications. Absorption was assayed by measuring the amount of radioactive phosphorous or rubidium compounds recovered in the plant after application of a known amount, such as a drop to a leaf.

**Results:** Research results indicated that absorption of phosphate compounds was greatly affected by pH. Absorption was least at those pH values when salt deposits were formed on the leaf surface, and greatest when salt deposits were not evident. The formation or lack of formation of salt deposits was correlated with the solubility and moisture retention of the predominant phosphate form present in solution. Hence, pH did not directly affect the plant's ability for phosphate absorption, but affected absorption by dictating the phosphate form present in solution and the degree of absorption was determined by properties of the predominant phosphate form present. Maximum phosphate absorption occurred with sodium phosphate at pH 3-6, with potassium and rubidium phosphate at pH 7-10, and with ammonium phosphate at all pH values. Calcium phosphate was not readily absorbed.

Absorption of rubidium (Rb) as Rb phosphate also was greatly affected by pH. It was minimal at pH 3-6, but was greatly increased at pH 7-10. This was due to the same factors that were shown to affect phosphate absorption (e.g. the degree of drying and formation of salt deposits on the leaf). Rubidium was used since it behaves similarly to potassium and serves as a radioactive tracer in the study of the uptake of potassium. Rubidium chlor-

ide (at pH 3-10) was absorbed to a greater degree than Rb sulfate or nitrate.

Urea, one of the most rapidly absorbed and effective compounds used in foliar nutrition, and several similar, chemically related compounds were assayed as to their effect on foliar absorption of Rb and phosphate. All of these substances decreased absorption of both Rb and phosphate, which was attributed to the formation of salt deposits.

These results indicate that dibasic phosphate ( $K_2HPO_4$ ), monobasic sodium phosphate ( $NaH_2PO_4$ ) and monobasic or dibasic ammonium phosphate — ( $NH_4H_2PO_4$ ) and [ $(NH_4)_2HPO_4$ ] respectively — are the most useful phosphate forms. Dibasic potassium phosphate and potassium chloride (KCl) are the most useful potassium forms for foliar application to commercial crop plants.

Several additional experiments were conducted in order to determine the effect of 18 commercially available surfactants (wetting agents) on foliar absorption. Only three (AL 825, Ethomid 0/15 and Tween 85) increased phosphate absorption, but all decreased Rb absorption. Of the three surfactants that increased phosphate absorption, only one (AL 825) was not toxic to the foliage, and therefore practically applicable. However, the advantage of increased phosphate absorption must be weighed against the decreased Rb absorption.

Time course studies demonstrated that both Rb and phosphate were rapidly absorbed and translocated throughout the plant, and hence, readily available for use by the plant. Absorption of both Rb and phosphate was not greatly affected by leaf age. This indicates that the data from all previous experiments, using only one leaf at a particular stage of development, are probably indicative of the response of the entire plant.

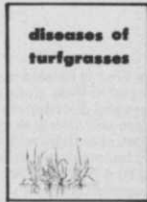
Absorption of phosphate by a variety of horticultural species varied greatly, ranging from less than 1% to approximately 15%, whereas Rb absorption ranged from less than 1% to approximately 40%. In addition, plants treated with foliar nutrients produced good growth following treatment and tolerated surprisingly high concentrations of nutrients to the foliage.

**Summary:** In summary, solution pH affected uptake of P and Rb compounds by dictating the chemical form of the compound present in solution. Solubility, moisture retention, and crystallization on the leaf surface were factors determining absorption. Partially as a result of this research, it can be seen that foliar nutrition offers advantages in production of commercial horticultural crops; in landscape maintenance; in more efficient use of fertilizer to reduce pollution of lakes, streams, and ground water supplies; to conserve energy and reduce costs; and is a very rapid means of correcting possible nutrient deficiencies. **WTT**

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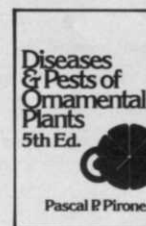
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# WTT Index 1978

KEY: Feature article (FA); news story (NS); conference report (CR); editorial (ED); government news (GN); news feature (NF); landscape contractor news (LCN).

## Articles

	Issue	Page
<b>A</b>		
AAN form council for national promotion (NS)	Jan.	12
(AAN) Nurserymen publish advertising guide (NS)	Feb.	72
AAN offers advice on loss deductions (NS)	May	13
AAN holds one of largest meetings yet (NF)	Aug.	9
AGSH forms to counter "cancerphobia" (GN)	Aug.	10
(ALCA) Contractors gather for Orlando meetings (LCN)	Mar.	10
ALCA to establish student chapters (LCN)	Sep.	10
ALCA eyes prospects (NS)	Sep.	8
ALCA network to provide wage input (LCN)	Oct.	10
(ALCA) Landscape contractors top billion dollar mark (LCN)	Oct.	10
Texas A & M University, Toro to study water uses (NS)	Sep.	13
APMS fights weeds on international level (NS)	Aug.	10
ASPA meeting keys on seed production (NS)	Aug.	9
Watson is presented agronomic award (NS)	Jan.	11
Managing Aquatic plants in small lakes and ponds (FA)	Jun.	16
Florida Aquatic Weed Control Aquatic Weed Contract Management (FA)	Mar.	51
(Aquatic Weeds) "Natural" Herbicide may be possible (NS)	Sep.	10
(Architect) How to improve the landscape contractor/architect relationship (ED)	Jul.	20
Athletic field managers say budgets are too low (NF)	Jul.	27
<b>B</b>		
(Bentgrass) New creeping bent released by Penn State (NS)	Oct.	9
Board views business skills, communication as keys to Growth (FA)	May	60
(Board) Ability to change research are vital according to board (FA)	Jun.	50
(Budgets) Athletic field managers say budgets are too low (NF)	Jul.	27
<b>C</b>		
(Cancerphobia) EPA forms to counter "Cancerphobia" (GN)	Aug.	10
CAST says EPA is unrealistic (GN)	Feb.	14
Cemetery and memorial park management	Nov.	25
Cemeteries strive harder to control maintenance costs	Nov.	26
(Cemetery) Jefferson Memorial Park: Example of cemetery changes	Nov.	30
Chemical Renovation on large college campus (FA)	Mar.	34
(Chemicals) DuPont will rebut EPA PRAR on Benomyl (GN)	Jan.	12
(Chemicals) Cadmium extended, Benomyl RPAR issued (GN)	Jan.	12
(Chemicals) Heptachlor/Chlordane hearing to close (GN)	Jan.	12
(Chemicals) Insecticides may have tree uses (NS)	Jan.	44
(Chemicals) Mirex OK'd for fire ants in S.C. (NS)	Jan.	11
(Chemicals) Scientists identify 5,000 needed uses (NS)	Feb.	12
(Chemicals) Trichem applies for fire ant products (NS)	Jan.	11
(Chemicals) Velsicol indictment comes as shock (NS)	Jan.	10
Chestnut blight, funds appropriated for (NS)	Sep.	13
(Clarke) Gravely acquires Hahn assets (NS)	Oct.	9
(Company notes) Branches added moves announced (NS)	Jul.	14
A Consultant can provide technology by Arnold H. Webster (FA)	Mar.	70
(Contract Appl. Mkt.) Florida Aquatic Weed Control Aquatic Weed Contract Management (FA)	Mar.	51

(Contract Appl. Mkt.) Forest City Tree: Tree Protection Contract Application (FA)	Mar.	59
(Contract Appl. Mkt.) Railroad Weed Control Rights-of-way Contract application (FA)	Mar.	67
(Contract Appl. Mkt.) Smith's Lawn & Tree Inc. Residential, Commercial Contract Application (FA)	Mar.	45
(Contract Appl. Mkt.) Weeds Trees & Turf surveys the Contract Application Market (FA)	Mar.	43
Contractors, architects, nurserymen discuss job estimating	Nov.	33
(Contractors) How to improve the landscape contractors/architect relationship (ED)	Jul.	20
Conwed opens new fiber mulch plant (LCN)	Sep.	10
Crab Apples can be both beautiful and tough by Douglas J. Champman (FA)	Mar.	27
(Crabgrass) Adjuvants may reduce crabgrass germination (NS)	May	14

## D

Davey Tree to be sold to employ group (NS)	Oct.	9
DBCP restrictions made permanent (GN)	Oct.	12
Dealers and distributors	Dec.	23
(Dealers and distributors) Lawn and Turf Inc.	Dec.	26
(Dealers and distributors) Olsen Dist.	Dec.	28
Decay factors in our urban forests (FA)	Nov.	14
(Diesels) Make way for diesels in turf care equipment (FA)	Jul.	42
Direct mail advertising boost to spring business (FA)	Feb.	42
Disanto Companies: Design, Build and Maintain (LCN)	Apr.	50
(Disease) Extension loss figures top \$90 million (NS)	Mar.	11
Distributors, Viewpoint (ED)	Sep.	5
DuPont will rebut EPA RPAR on Benomyl (GN)	Jan.	12
DuPont will fight for EBDC fungicides (GN)	Feb.	14
DuPont rebuts RPAR on fungicides (GN)	Apr.	15

## E

Echo expands distribution facility (NS)	Jan.	44
Environmentalists focus on cities (GN)	Jun.	12
(EPA) Mirex OK'd for fire ants in S.C. (NS)	Jan.	11
EPA announces restricted list (NS)	Mar.	12
(EPA) DBCP restrictions made permanent (GN)	Oct.	12
EPA officials to see arborists work (GN)	Jun.	12
EPA officials observe tree spraying by NAA (NS)	Jul.	12
(EPA) Options sought for disposal regulations (GN)	Sep.	13
(EPA) President wants EPA's budget increased (GN)	Mar.	12
(EPA) 2.4.5-T RPAR involves 424 different products (GN)	May	14
(EPA) Reregistration costs may soar 50 percent (GN)	May	14
EPA returns generic name proposals (GN)	Aug.	10
(EPA) two maybe's, one yes against 2.4-D (GN)	Jun.	12
(Equipment) Conwed opens new fiber mulch plant (LCN)	Sep.	10
(Equipment) FMC will market Japanese tractor line (NS)	Feb.	12
(Equipment) Jacobsen and Textron ink sale agreement (NS)	Jun.	10
(Equipment) Ransomes, Wisconsin in new venture (NS)	Oct.	10
(Equipment) Tower simulates rainfall provides facts about mulches (FA)	Oct.	22
(Erosion) Denver erosion meeting planned (LCN)	Jun.	10
(Erosion Control) ALCA eyes prospects (NS)	Sep.	8
(Erosion Control) Mulches and binding agents to achieve (FA)	Jun.	22
Erosion Problems, Superintendent uses steel piling to solve muskrat (FA)	Jan.	36

## F

(Fertilizers) Soil Test is key to proper fertilization (NF)	Feb.	27
Fertilizers, Turf: The Trends & Basics (FA)	Feb.	24
(FIFRA) Conference committee agrees on state primacy (GN)	Sep.	13
(FIFRA) Inconsistent use exceptions settled (GN)	Sep.	13
FIFRA approved by congress (GN)	Oct.	12
(Finance) Keys to finance a business expansion (FA)	Jul.	41
FMC will market Japanese tractor line (NS)	Feb.	12

## G

GAO to review EPA (GN)	Feb.	14
GAO, State registration questioned by (GN)	Mar.	12
GCSSA Takes Over San Antonio (NS)	Apr.	12
(Georgia Tech) Universities use shredders for renovation and composting (NF)	Sep.	16
Gold Metal Winner, Brooklyn Park: (NF)	Oct.	35
(Golf) Use of wastewater subject of survey (NS)	Jul.	12
Grasses, Manager Guide to Warm Season (FA)	Mar.	80
Grasses with high tolerance to road salt	Dec.	31
(Grass Seed), Viewpoint (ED)	Aug.	6

<b>H</b>	
(Hahn Inc.) Gravely acquires Hahn assets (NS) .....	Oct. 9
Helicopter Spraying by Charles H. Tadge (FA) .....	Jan. 22
(Herbicides) Comparison of Preemergent Herbicides for Crabgrass by Ralph E. Engel & C. W. Bussey (FA) .....	Feb. 34
(Herbicides) "Natural" herbicide may be possible (NS) .....	Sep. 10
(Horticulture) Fourteen \$500 grants available for research (NS) .....	Feb. 14
(Horticulture) Penn plant variety becomes cover crop (NS) .....	Mar. 104
(Horticulture) Solar energy, rocks to heat greenhouses (NS) .....	Sep. 10

<b>I</b>	
ICI is studying cause of clabber (NS) .....	Mar. 103
Idaho foresters get revegetation results (NS) .....	Jul. 16
(Industry Advisory Board) Twelve Experts to Advise Magazine for Green Industry (FA) .....	Apr. 70
(Irrigation) Andrus agrees with irrigation rules (NS) .....	Jan. 11
(Irrigation) Partially Treated Wastewater Solves Florida Irrigation problem (FA) .....	Mar. 73
(Irrigation) Sprinkler Equipment From Irrigation Manual by James A. Watkins (FA) .....	Apr. 24
(Irrigation) Symposium is set on wastewater irrigation (NS) .....	Oct. 10
(Irrigation) Texas A & M, Toro to study water use (NS) .....	Sep. 13
(Irrigation) Toro announces low-cost system (NS) .....	Mar. 11
IRS offers chance to switch accounting (NS) .....	Sep. 8

<b>K</b>	
Kentucky clinic to feature experts (NS) .....	Jan. 11
Kentucky Bluegrass, Greenbug Damage found on (FA) .....	Oct. 26

<b>L</b>	
Labor act now up to Senate (GN) .....	Jun. 12
Labor reform act has pro-union effect (GN) .....	May 14
(Labor Reform Bill) Cloture fails again, labor bill delayed (GN) .....	Sep. 13

(Labor) Viewpoint by Bruce F. Shank (ED) .....	Jun. 6
(Land Reclamation) Growth in Land Reclamation to Take Significant Jump (FA) .....	Jun. 27
(Land Reclamation) Peabody Coal Co.: Abiding By Changing Laws (FA) .....	Jun. 30
(Land Reclamation) Southern Seeding Service: 35 Years in Erosion Control (FA) .....	Jun. 36
Landscape Award Program, NLA announces landscape award winners (LCN) .....	Aug. 10
(Landscape) Contractors gather for Orlando meeting (LCN) .....	Mar. 10
(Landscape) Firms predict jump in business (NS) .....	Mar. 11
(Landscape) Kentucky clinic to feature experts (NS) .....	Jan. 11
(Landscape) Most landscape firms charge for plans (NS) .....	Feb. 13
Landscape Contractors Market Statistics (LCN) .....	Apr. 39
(Landscape Contractor) California tax cut may help landscapers (LCN) .....	Jun. 10
(Landscape Contractor) Construction & Design by Naud Burnett (LCN) .....	Apr. 63
(Landscape Contractor) Contra Costa: General Landscaping & Hydroseeding (LCN) .....	Apr. 42
(Landscape Contractor) Disanto Companies: Design, Build and Maintain (LCN) .....	Apr. 50
(Landscape Contractor) Ladybug Industries: Maintenance Specialists (LCN) .....	Apr. 56
Landscape Contractors top billion dollar mark (LCN) .....	Oct. 10
(Lawn Care) Manufacturers form lawn & garden group (NS) .....	May 14
(Lawn Care) Manufacturers invited to Chicago by group (NS) .....	Jun. 12
Lofts establishes new sod division (NS) .....	Oct. 12

<b>M</b>	
Memorial Park: Farmland to Funland (NF) .....	Oct. 42
Miss Sites to receive funds chosen (LCN) .....	Jun. 10
Mississippi degree attracts out-of-staters (LCN) .....	Sep. 10
Mistblowers by William Burdick (FA) .....	Jan. 19
Mower Engine Trouble Shooting (FA) .....	Apr. 18

<b>N</b>	
National Federation is born in Texas (NS) .....	Mar. 10
NLA announces Landscape Award winners (LCN) .....	Aug. 10
NLA survey finds guarantee confusion (LCN) .....	Oct. 10
(National Turfgrass Federation) Viewpoint by Bruce Shank (ED) .....	Mar. 6

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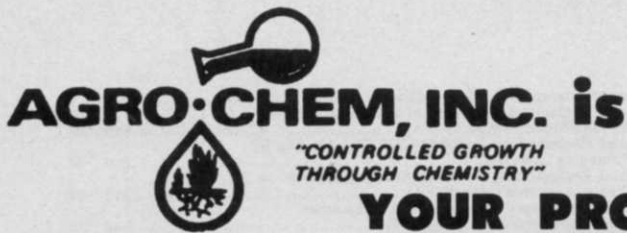
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pH of Soil												
Organic Matter %												
Nitrogen No./Acre												
Sulfates No./Acre												
Phosphates No./Acre (P <sub>2</sub> O <sub>5</sub> )												
Calcium No./Acre												
Magnesium No./Acre												
Potassium No./Acre												
Sodium No./Acre												
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- 1—Electric hose reel
- 1—Gas engine & special Pump
- 1—Lawn gun with assorted nozzels
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- 1 each—Suction & Bi-pass hose
- 1—Root feeder

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This basic spray rig is designed to fit in a pick-up truck, the tank situated between the rear wheel well and cab of truck. The motor, pump and hose reel on the right side leaving the remainder of the truck bed for other equipment and supplies.



Van pictured shows the basic spray unit in the van, leaving the entire rear area for storage of products.

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(Nursery) AAN forms council for national promotion (NS) .....	Jan. 12
(Nursery) AAN offers advice on loss deductions (NS) .....	May 13
(Nursery) Biological waste process developed (NS) .....	Mar. 11
(Nursery) Cal Poly alumni to create curriculum (NS) .....	Jan. 11
(Nursery) Credit Card risky as payment in advance (NS) .....	Feb. 14
(Nursery) Florida nurserymen offer cold pointers (NS) .....	Jan. 44
(Nursery) IRS offers chance to switch accounting (NS) .....	Sep. 8
Nurserymen publish advertising guide (NS) .....	Feb. 72

**O**

(Ohio Turf Conference) Snow didn't scare Ohio turf show goes (NS) .....	Jan. 10
(OHPA) Cal Poly alumni to create curriculum (NS) .....	Jan. 11
OSHA permits access to safety records (GN) .....	Sep. 13
(OSHA) Subcontractor is liable for site safety (LCN) .....	Sep. 10
(OSHA) Small businesses exempted from OSHA logs (GN) .....	Oct. 12

**P**

(Penn State University) Universities use shredders for renovation and composting (NF) .....	Sept. 16
(Penn State University) New creeping bent released by Penn State (NS) .....	Oct. 9
Pennwalt Issued Experimental Use Permit (GN) .....	Jan. 12
(People) Viewpoint by Bruce Shank (ED) .....	Apr. 8
(Pesticides) ICI is studying cause of clabber (NS) .....	Mar. 103
(Pesticides) Experimental sprayer avoids handling risks (NS) .....	Sep. 8
(Pesticide Labels) Inconsistent use exceptions settled (GN) .....	Sep. 13
Pickseed to market two new ryegrasses (NS) .....	Oct. 12
Prairie Hay also provide seed (NS) .....	Sep. 8
Public Parks, Citizens Pay \$16 each for use of (NF) .....	Oct. 31
Public Parks by Bruce Shank (ED) .....	Oct. 8
Purdue University: Three types of turf (NF) .....	Jul. 32
(Purdue University) New tree wrap save time, labor (NS) .....	Jul. 14
Pursley turf grass: warm climate sod specialists (FA) .....	Aug. 22

**R**

Railroad Weed Control Rights-of-way Contract Application (FA) .....	Mar. 67
Ransomes, Wisconsin in new venture (NS) .....	Oct. 10
(Reader Comment Card) Viewpoint by Bruce Shank (ED) .....	Jan. 6
(Reader Comment Card) Viewpoint by Bruce Shank (ED) .....	Feb. 8
(Reclamation) Field trips set for Canadian meeting (NS) .....	Apr. 13
(Reclamation) Grants from coal tax to be distributed soon (NS) .....	May 12
(Reclamation) Kentucky seminar presents latest technology (NS) .....	Jun. 9
(Reclamation) Prairie Hay mulches also provide seed (NS) .....	Sep. 8
(Reclamation) Sulfuric acid improves mine spoils (NS) .....	Feb. 13
(Revegetation) Canyon Building site presents unique revegetation challenge (FA) .....	Mar. 18
(Rights-of-way) UPDATE: Utility Rights of Way Little has changed since 1972 (NF) .....	May 18
Rollins College: heavy use of eight acres (NF) .....	Jul. 36

**S**

Scotts gains label for atatenius control (NS) .....	Jul. 16
(Seed) Burning limits due this month in Oregon (NS) .....	Apr. 12
(Shredders) Universities use shredders for renovation & composting (NF) .....	Sep. 16
(Sod) Lofts establishes new sod division (NS) .....	Oct. 12
Fixed Sod cost decreases as Maryland farm size rises (FA) .....	Sep. 71
Costs and returns of Maryland Sod Production (FA) .....	Oct. 47
(Sod) Nassau conference set for sod growers (NS) .....	Jan. 43
Sod produces plant fewer acres in 1978 (NF) .....	Aug. 19
Pacific Sod Farms: Trying twice as hard (NF) .....	Aug. 28
Maryland notes changes in Sod Production since 1968 (FA) .....	Aug. 33
(Soil) Flooding can cause damage from gas (NS) .....	Feb. 73
The Science of Soils from New Turf Handbook by Wm. H. Daniel .....	Jan. 26
Soil pasteurization is cheaper alternative (NS) .....	Jul. 12
Soil Property Determinations with portable testers .....	Nov. 20
Soil Test is key to proper fertilization (NF) .....	Feb. 27
Solar Energy, rocks to heat greenhouses (NS) .....	Sep. 10

(Spray Application) Selecting the proper spray application system by Ron Morris (FA) .....	Jan. 14
(Sprayers) Experimental sprayer avoids handling risks (NS) .....	Sep. 8
(Sprinkler) Operation and control of Sprinkler systems by James A. Watkins (FA) .....	May 49
(Steel Piling) Superintendent Uses Steel Piling to solve Muskrat, Erosion Problems (FA) .....	Jan. 36
Subcontractor is liable for site safety (LCN) .....	Sep. 10

**T**

Tilapia fish has dual benefit (NS) .....	Jul. 16
Toro announces low cost system (NS) .....	Mar. 11
Texas A & M, Toro to study water use (NS) .....	Sep. 13
(Trees) Decay factors in our urban forests .....	No. 14
(Tree) Echo expands distribution facility (NS) .....	Jan. 44
Trees, Efficiency can increase by pruning young (FA) .....	Apr. 78
(Trees) Funds appropriated for chestnut blight (NS) .....	Sep. 13
Ice Storms to add to spring business (NS) .....	Apr. 13
(Trees) NAA Florida meeting has record attendance (NS) .....	Apr. 15
(Trees) New trees wrap saves time, labor (NS) .....	Jul. 14
(Tree) Red Oak tested for wilt resistance (NS) .....	Feb. 13
(Tree) Sex Pheromone Traps Useful in Controlling Tree Borers (FA) .....	May 22
(Tree) Top 20 trees derived from study (NS) .....	Feb. 13
(Tree) Trends in tree planting on mine reclamation sites by Rufus Allen (FA) .....	Jun. 42
(Tree Fertilization) Growth in tree fertilization linked to professional method (ED) .....	Aug. 14
(Tree Fertilization) Species, Soil, location affect tree fertilization (FA) .....	Oct. 16
(Tree Protection) Forest City Tree: Tree Protection Contract Application (FA) .....	Mar. 59
(Trees) Restoring Fort Lauderdale's Tree Canopy .....	Dec. 16
Trichem applies for fire ant productions (NS) .....	Jan. 11
(Turf) Adjuvants may reduce crabgrass germination (NS) .....	May 14
(Turf) Michigan firm publishes bibliography (NS) .....	Mar. 11
(Turf) Mower manufacturers urge practical standards (NS) .....	Jun. 9
(Turf) Musser Foundation takes funding action (NS) .....	Mar. 12
(Turf) National federation is born in Texas (NS) .....	Mar. 10
(Turf) Ohio research center to build rhizotron (NS) .....	Jan. 12
(Turf) Purdue University three types of turf (NF) .....	Jul. 32
(Turf) Scotts gains label for Atatenius control (NS) .....	Jul. 16
(Turf) Snow didn't scare Ohio turf show goes (NS) .....	Jan. 10
(Turf) Sod producers set for field day in Spokane (NS) .....	May 12
(Turf) Still no pact on seed burning (NS) .....	Jun. 12
(Turf) Symposium is set on wastewater irrigation (NS) .....	Oct. 10
(Turf) Watson recommends drought measures (NS) .....	Feb. 60
(Turf Care) Viewpoint by Bruce Shank (ED) .....	Jul. 8
(Turf Expo) Southern California turf expo approaches (LCN) .....	Sep. 10
Turf Fertilizers: The Trend & Basics (FA) .....	Feb. 24
Turf Grass, Pursley, warm climate sod specialists (FA) .....	Aug. 22

**U**

USGA reorganizes headquarters staff (NS) .....	Feb. 12
Uniroyal question's EPA's MH test (GN) .....	Apr. 15

**V**

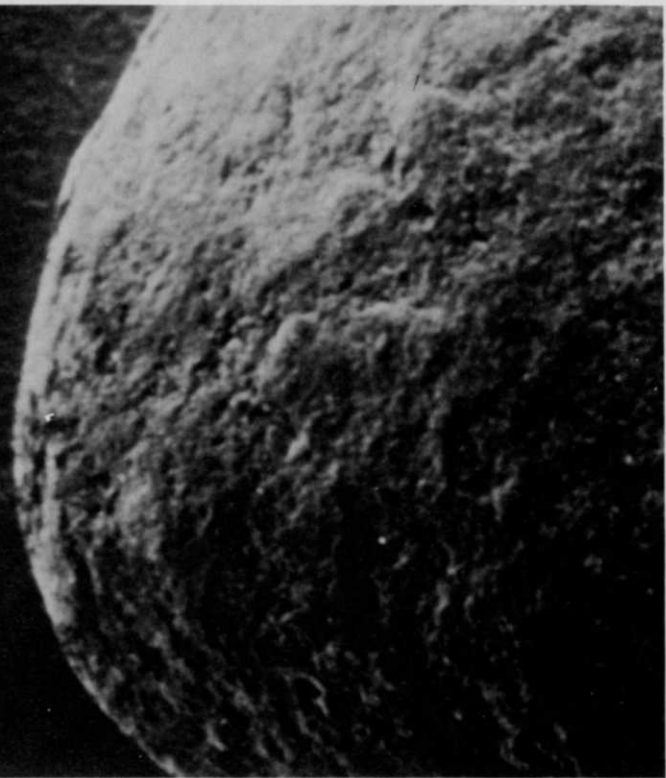
Vegetation Management by Roger Funk (FA) .....	Jan. 44
Vegetation Management by Roger Funk (FA) .....	Feb. 62
Vegetation Management by Roger Funk (FA) .....	Mar. 94
Vegetation Management by Roger Funk (FA) .....	Apr. 80
Vegetation Management by Roger Funk (FA) .....	May 62
Vegetation Management by Roger Funk (FA) .....	Jun. 56
Velsicol indictment comes as shock (NS) .....	Jan. 10
Velsicol, EPA reach chlordane agreement (GN) .....	Apr. 15
Viewpoint by Bruce F. Shank (ED) .....	May 6
Virginia turfgrass show draws 280 delegates (NS) .....	May 63

**W**

(Weeds) SWSS probes cost, benefit of herbicides (NS) .....	Feb. 73
(Weed Control) Guide to Weed Control for Managers of Turf by William H. Daniel (FA) .....	Feb. 51
Wholesale Growers exceed one billion dollars in sales (FA) .....	May 27
(Wholesale Growers) Conard Pyle Company: Growing with the roses (FA) .....	May 30
(Wholesale Grower) Schmidt and Son: Propagators of Deciduous Trees (FA) .....	May 38
(Wholesale Grower) Wight Nurseries: Specializing in Evergreens (FA) .....	May 44
The Winter Grain Mite Winter Pest of Turf (FA) .....	Feb. 22



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## Authors

Allen, Rufus, "Trends in tree planting on mine reclamation sites" .....	Jun. 42	Niemczyk, Dr. Harry D., "The Winter Grain Mite Winter Pest of Turf" .....	Feb. 22
Bailey, Rod, "Keys to financing a business expansion" .....	Jul. 41	Randell, R., "Greenburg Damage Found On Kentucky Bluegrass" .....	Oct. 26
Blazer, R. E., "Mulches and Binding Agents to Achieve Erosion" .....	Jun. 22	Shank, Bruce F., "How To Improve The Landscape Contractor/Architect Relationship" .....	Jul. 20
Burdick, William, "Mistblowers" .....	Jan. 19	Shank, Bruce F., "Growth In Tree Fertilization Linked To Professional Method" .....	Aug. 14
Burnett, Naud, "Construction & Design" .....	Apr. 63	Shearman, Robert C., "Make Way For Diesels In Turf Equipment" .....	Jul. 48
Bussey, C. W., "Comparison of Preemergent Herbicides for Crabgrass" .....	Feb. 34	Shigo, Alex, Dealing with decay factors in our urban forests .....	Nov. 14
Carter, Thomas, "Make Way For Diesels In Turf Care Equipment" .....	Jul. 42	Smith, Elton M., "Species, Soil, Location Affect Tree Fertilization" .....	Oct. 16
Chapman, Douglas J., "Crab Apples Can Be Both Beautiful and Tough" .....	Mar. 27	Street, J. R., "Greenburg Damage Found On Kentucky Bluegrass" .....	Oct. 26
Chapman, Douglas J., "Efficiency Can Increase By Pruning Young Trees" .....	Apr. 78	Tadge, Charles H., "Helicopter Spraying" .....	Jan. 22
Clayton, C., "Greenbug Damage Found On Kentucky Bluegrass" .....	Oct. 26	Watkins, James, A., "Sprinkler Equipment From Irrigation Manual" .....	Apr. 24
Daniels, William H., "The Science of Soils From New Turf Handbook" .....	Jan. 26	Watkins, James A., "Operation And Control Of Sprinkler Systems" .....	May 49
Daniels, William H., "Guide to Weed Control For Managers Of Turf" .....	Feb. 51	Webster, Arnold H., "Consultant Can Provide Technology" .....	Mar. 70
Daniels, William H., "Managers's Guide To Warm Season Grasses" .....	Mar. 80		
Engel, Ralph E., "Comparison of Preemergent Herbicides for Crabgrass" with C. W. Bussey .....	Feb. 34		
Gilbert, Thomas J., "Maryland notes changes in Sod Production since 1968" .....	Aug. 33		
Gilbert, Thomas J., "Fixed Sod Cost Decreases As Maryland Farm Size Rises" .....	Sep. 71		
Gilbert, Thomas J., "Costs and Returns of Maryland Sod Production" .....	Oct. 47		
Kay, Burgess L., "Tower Simulates Rainfall Provides Facts About Mulches" .....	Oct. 22		
Lessley, Bill V., "Maryland Notes Changes In Sod Production Since 1968" .....	Aug. 33		
Lessley, Billy V., "Costs And Returns Of Maryland Sod Production" .....	Oct. 47		
Mackey, Dan, Restoring Fort Lauderdale's tree canopy .....	Dec. 16		
Morris, Ron, "Selecting The Proper Spray Application System" .....	Jan. 14		
Morris, Ron, "Pursley Turf Grass: Warm Climate Sod Specialists" .....	Aug. 22		
Nielson, David G., "Sex Pheromone Traps Useful In Controlling Tree Borers" .....	May 22		

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