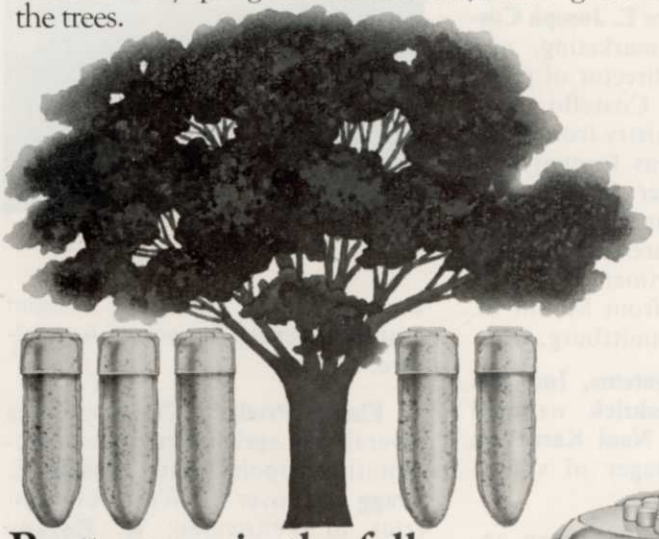
"I like to send trees into winter in good, healthy condition. That's why I feed in the fall with Jobe's Spikes."

Frank Lamphier, Superintendent Aspetuck Valley Country Club, Weston, Connecticut

"Last winter, we had three weeks when the temperature was never above 10 degrees. Weather like that is rough on trees, so I believe in sending them into winter in the best possible condition. We use Jobe's Spikes on everything in the fall...willows, evergreens, maples, all our trees and shrubs."

Jobe's makes good fall or winter fill-in work.

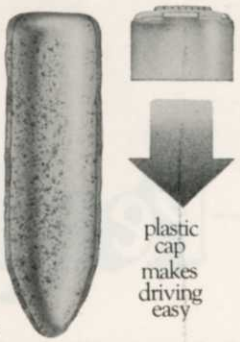
When work slacks off, it's time to get busy with Jobe's® Tree and Shrub Spikes. It helps eliminate one chore from the busy spring-summer months, and it's good for the trees.



Roots grow in the fall, so feed them in the fall.

Feeding with Jobe's Spikes in the fall while roots are growing helps overcome weakness brought on by summer heat, lack of moisture and ravages of insects. Helps trees get through winter in shape for a strong start in the spring. Just pound Jobe's Spikes into moist ground at the dripline at the rate of 1 per inch of trunk diameter.

Frank Lamphier says, "Jobe's Spikes are long lasting. When we use them in the fall, the trees get nourishment for the winter. Then, when spring rains start, the balance of the fertilizer is released to shoot them off for spring. We think one Spike does more good than one to two pounds of ordinary fertilizer."



"Jobe's Spikes work!"

"We started 12-inch pine seedlings 4 years ago, and now they're 6 to 8 feet tall. We fed them at transplanting with Jobe's Spikes and have fed them ever since with Jobe's. Growth like that really sold me." University leaching studies have shown that Jobe's Spikes are as effective as drilled fertilizer. Rainwater carries nutrients from the Spike to the root zone to a depth of at least 24 inches.

Jobe's Spikes are better than surface-applied fertilizer. You don't worry about run-off losses or about burning turf or causing excessive turf growth around trees.

"You can just tap them in with a hammer in moist ground."

A hammer is all the equipment you need with Jobe's Spikes. No bulky auger to carry from job to job. Nothing to break. No maintenance costs. No fertilizer bags to tear or spill.

Jobe's Spikes are a pre-measured amount of 16-8-8 fertilizer formed into a rigid, easy-to-drive spike.

"Jobe's Spikes don't take much space, or time."

"I can send a man out on a 3-wheel cart with enough Spikes to last all day.

"Working fast is important because I have just 7 men, and only 4 year-round. We're working on a major landscape program with trees and shrubs to improve the looks of the course. Jobe's Spikes really save us time."

Jobe's Evergreen Spikes 12-6-8 and Fruit Tree Spikes 5-15-15 are now available in bulk packs. They can be combined for shipping with Tree and Shrub Spikes.

Call your local Jobe's distributor or order direct. $30 per case (105 Spikes) prepaid, 5 case minimum. 15 or more cases, $25 per case.

The easy method for professional tree care. International Spike, Inc., 462 East High Street, Lexington, Kentucky 40508.

People on the Move

Robert J. Nicolazzi has been appointed general marketing manager for **Ford Motor Company's** worldwide tractor operations. Nicolazzi joined the company in 1963 as a purchasing coordinator. He has held numerous positions in planning, marketing, purchasing and sales at the company's European tractor operations and at Ford's North American Tractor & Implement Operations. He holds a degree in business administration from the University of Notre Dame.

Diamond Shamrock announces three new appointments in the agricultural chemicals division. **Doctors Myron Bliss Jr.** and **Gary L. Eilrich** have been named managers of field

L. F. Cherry

development and **L. F. Cherry** has been named national field sales manager.

Drs. Bliss and Eilrich will be responsible for the planning and progress of appropriate field research at universities and in-house field research to improve efficiency in defining product utility and development of data in support of federal registrations. Cherry's responsibilities include management of the field sales force, including the five regional offices, managers, and their sales forces.

Cherry joined the company in 1962 and was district sales supervisor for eight years before his most recent prior appointment as Midwest regional sales manager for the division in 1970. Bliss holds a Ph.D. in Entomology from Pennsylvania State University. Eilrich received his Ph.D. in plant pathology from the University of Illinois.

Two new appointments in the specialty chemicals division of **ICI United States Inc.** are **E. Joseph Costello,** director of marketing, and **Thomas J. Galvin,** director of product development. Costello, who holds a B.S. in chemistry from Villanova University, was formerly national sales manager for the division. Galvin, formerly assistant director of the venture appraisal and development department, holds a B.A. in chemistry from Mount St. Mary's College, Emmitsburg, Md.

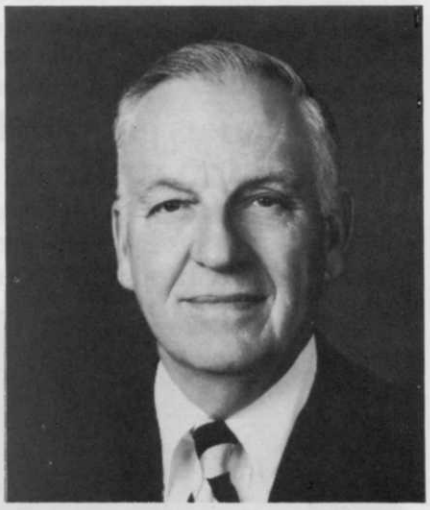
Dicoa Irrigation Systems, Inc. has named **Richard Bobrick** national sales manager and **Nani Karu** vice president and manager of system engineering.

Thomas M. Rooney has been appointed western retail district manager for the agricultural chemicals division of **Vistron Corp.** In his new post, Rooney will direct the operations of 45 of Vistron's Sohigro retail outlets in a five-state area in the Midwest.

Jeff Raymond, Applied Biochemists Inc. southeastern regional salesman, adds five new states to his territory: Indiana, Kentucky, Michigan, Ohio and Tennessee.

Monsanto Agricultural Products Company has named **Daniel M. Donahue** Roundup herbicide industrial sales representative for the southeastern United States. Donahue joined the company in 1972 as a sales representative in the Mankato, Minnesota district. He holds a B.S. in agriculture economics from South Dakota State University.

Joining the **Toro Company** sales staff as marketing representative for the Pacific Northwest is **Robert M. Morgan.** Morgan, a native of Portland, Ore., and a former president of the Sprinkler Irrigation Assoc., has over 40 years in the sprinkler irrigation and farm equipment areas. He



Robert M. Morgan

was graduated from the Oregon State University School of Agriculture.

Elanco Products Co. announces several new agricultural sales representative appointments. **Ronald E. Bragg** will cover the West Delta district in Tennessee; **R. Eugene Eubanks** joins the Omaha district; **Nicolas R. Herbert,** the South Delta sales district in Louisiana; **Robert E. Rushton,** Columbus sales district, Michigan; **Kathleen M. Wilson,** Minneapolis sales district; **Michael D. Simpson,** Dallas; **Brett M. Oemichen,** Minneapolis, **C. Levon Martin,** Atlanta East. All of these sales representatives have prior sales experience with the company.

At **Ciba-Geigy Corp., Norm Thomsen** transfers to a Virginia territory for the agricultural division. His territory covers 38 counties in eastern Virginia. His most recent prior position was merchandising specialist. **Ted Ramirez** joins the company as a field sales representative serving 41 counties in southern Louisiana. He comes from the U.S. Department of Agriculture Statistical Reporting Service.

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WHY A FERTILIZER BURNS

by William Knoop

In the development of a nitrogen nutrition program, the turfgrass manager has the choice of applying soluble nitrogen or slowly soluble nitrogen, or applying a fertilizer that contains a combination of soluble and slowly soluble nitrogen sources. As a result of higher fertilizer prices and supply shortages during the past few years, turfgrass managers have tended to use more soluble nitrogen fertilizers than before.

One of the characteristics of soluble nitrogen fertilizers is their increased tendency to "burn" turfgrasses. The risk of fertilizer burn is one of the reasons why many turfgrass managers have tended to use nitrogen fertilizers that contain a high percentage of slowly soluble nitrogen rather than the totally soluble nitrogen fertilizers.

Soluble nitrogen fertilizers, if applied properly, can be just as effective (as a slowly soluble nitrogen source) in providing the turfgrass plant with the nitrogen it requires. The risk of burn may be minimized if the factors that contribute to a burn are understood.

Fertilizers contain salts. These salts are not unlike table salt except that they contain various plant nutrients. When a salt is added to water the osmotic pressure of the solution is increased. Osmotic pressure is, in a sense, a measure of how tightly water is held in a solution. When a fertilizer, either as a solid or a liquid, is applied to the surface of the soil, the fertilizer salts must sooner or later enter and become a part of the soil solution before the nutrients can enter the roots and be used by the turfgrass plant. The increase in the osmotic pressure of the soil solution associated with the application of a fertilizer may determine whether the plant will survive or will die from a fertilizer burn.

For a plant's root system to take in water, the water must pass through a root cell membrane. Water can pass through this membrane only when the osmotic pressure of the solution inside the cell is higher than the osmotic pressure of the soil solution outside the cell. Water moves from a solution with low osmotic pressure into a solution with higher osmotic pressure. If the osmotic pressure of the soil solution becomes higher than that of the solution inside the cell, water cannot enter the cell and may even move out of it. This results in the death of the cell. When root cells die, the whole plant may die. The end result is termed a "fertilizer burn."

An understanding of the potential salt effect of the various fertilizer materials can help prevent possible fertilizer burn. Salt index values are a measure of a material's relative tendency to increase the osmotic pressure of the soil solution as compared with the increase caused by an equal weight of sodium nitrate. The salt index of sodium nitrate is 100. The higher the salt index, the greater the potential of a material to increase the osmotic pressure of the soil solution and thus the potential for burn. As indicated in Tables 1 and 2, there are wide differences in the salt indexes of those fertilizer materials used.

Note that Table 1 also lists the salt indexes of selected nitrogen fertilizers in terms of single units of N. Nitrogen is applied on a unit basis (i.e., pounds per 1000 sq. ft.). Although a material such as ammonium sulfate has a lower salt index than urea, the salt effect of applied urea is lower because it contains a higher percentage of N.

The potential for burn is not totally dependent on the salt index of the fertilizer material. The moisture status of the soil and of the turfgrass plant is also important. If the level of the soil solution is low, a fertilizer will have a greater effect on increasing the osmotic pressure of the soil solution. When a fertilizer is "watered in," the volume of the soil solution increases and thus the osmotic pressure of the soil solution is reduced. In well drained soils, however, heavy applications of water, while having the beneficial effect of reducing the osmotic pressure of the soil solution, may also have the harmful effect of leaching nutrients past the root system.

The water status of the plant is affected by both the air temperature and the humidity, which is the amount of water in the air surrounding the plant. These factors to a large degree affect the plant's water requirements. As the air temperature increases, the plant requires more water and as the humidity decreases the plant requires more water. As the osmotic pressure of the soil solution increases, less and less water is available to the plant. Watering in a fertilizer material may increase the water available to the root system by decreasing the osmotic pressure of the soil solution, but may also aid in reducing the plant's water requirements by cooling the plant and increasing the humidity of the plant's microenvironment.

Soluble fertilizer materials may be used at any time of the year with minimal risk of damage to turf if the factors that contribute to a burn are understood. The salt index of a fertilizer material is extremely important, espcecially when the fertilizer is highly soluble. The rates of application must be lower when a fertilizer with a high salt index is used, basically because of the salt effect.

Fertilizers with a low salt index should be used when soil test results indicate the presence of excessive levels of soluble salts in the soil. □

Mr. Knoop is assistant professor of horticulture at Iowa State University.

TABLE 1. Salt Index Values for commonly used nitrogen fertilizer materials.

Material	Approx. % N	Salt Index	Salt Index per Unit of N
Ammonium Nitrate	33	105	3.2
Ammonium Sulfate	21	69	3.3
Calcium Nitrate	12	53	4.4
I.B.D.U.	31	5	0.1
Potassium Nitrate	14	74	5.3
Natural Organic	5	4	0.8
UF	38	10	0.3
Urea	45	75	1.7

TABLE 2. Salt Index values for other commonly used materials.

Material	Approx. Nutrient Level	Salt Index
Superphosphate	20% P_2O_5	8
Potassium Chloride	60% K_2O	114
Potassium Sulfate	50% K_2O	46
Dolomite	30% CaO 20% MgO	1
Gypsom	33% CaO	8
Epsom Salts	16% MgO	44

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"Green Team" helps customer

Ted Collins, president of the Victor-based tree and landscape company bearing his name, has begun a new policy of giving employees a greater voice in company management.

With the formation of "The Green Team," the sales, production and office staffs appoint representatives to meet regularly with Collins to air differences, provide suggestions for smoother operation of their departments, and keep Collins in tune with employee needs and desires.

"This is not," says Collins, "A squaring off of management and employees. Department heads and other company officers are not invited to Green Team meetings. It's simply the team and me around a table. Many of their suggestions have been implemented, others are under further consideration.

"The real benefactor of this management system is our customer. Every suggestion made so far by The Green Team has been for better customer service. We in management are often removed from direct contact with the customers, whereas our Green Team members are in constant touch with the public, so their advice has been very service oriented.

"Of course, this works both ways," Collins continued, "Green Team meetings give me an opportunity to candidly discuss management's views without it sounding like an edict. And, when a situation is thoroughly reviewed and team members know the reasons for our position, they can better communicate that to their peers."

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Take a knife to your grass. You may find it's choking itself.

Take a knife and cut out a small section of turf. Then take a look at the brown, dead material over the top of the soil around the blades of grass. This is thatch. And it may be choking your grass.

A small amount of thatch is desirable to protect tender shoots from the sun and hold moisture in the soil. But if you have more than a one-half inch build-up, it can keep air, water, and fertilizer from reaching the root zone.

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Grading and shaping for erosion control and rapid vegetative establishment

by F. W. Glover, USDA Soil Conservation Service, Marshall Augustine, consultant to Hittman Associates, Inc., and Michael Clar, engineer, Hittman Associates, Inc.

Erosion control of lands in humid areas drastically disturbed by coal surface mining is strongly influenced by four principal factors: climate, soils, vegetation, and topography. The climate for any given region is fixed. Man's control over climate is very limited. But he can schedule sensitive field operations around the local weather patterns. Vegetation is the most flexible of these factors. Plant materials are available for almost any situation in the humid regions of the United States, provided their establishment is supported by known conservation measures and if the soils and topography are suitable.

Objectives

The basic objective of an erosion control program for a surface mined area is to stabilize the disturbed area. When the area is stabilized, the volume of sediment generated will be minimized and off-site damage reduced. Therefore the principal objective of grading and shaping operations should be to manipulate the soil and topography to assist in the control of surface runoff, thus reducing erosion and improving effective vegetative establishment.

In addition, there are several secondary objectives. The grading and shaping features of an erosion control program must also be compatible with the land use planned for the area after mining and reclamation are completed. The soil and topography required should be identified before making the grading plan.

Plans for grading and shaping should include making full use of the materials or land resources at the site. Large rocks and boulders can be buried or they can be placed on toeslopes to make use of their properties of resistance to weathering. If durable, they can be used as rip-rap for stabilizing waterways or as special features on recreation sites. Brush and other woody materials can be windrowed at the toe of fills and used as a partial filter. They can be fed through a woodchipper and used as a mulch for soil stabilization. The potential use of all materials at the site should be considered in preparing the min-

ing plan and in determining the use of the land after mining.

As a minimum the grading and sloping operations must conform to state laws. Most states have grading specifications included in their reclamation requirements. These specifications usually require that the peaks and ridges be reduced by grading to a rolling, sloping, or terraced topography. Areas reclaimed for uses such as forest plantation and wildlife may require less grading than for other uses. In addition some states require that acid-forming material be covered with a minimum depth (2 to 4 feet) of material suitable to support plant growth. Most states have set a time limit on the completion of the reclamation operations; a 2- to 3-year limit is most common.

Soil Characteristics

Soil materials resulting from mining have physical and chemical characteristics unique to each site. The physical-chemical characteristics of the soil materials at a particular site must be known and considered in planning the shaping and grading operations. The characteristics of such soils that most influence the stated objectives include the toxicity or potential toxicity of the material and the capacity to hold water.

Potentially toxic acid-forming material can be handled in two ways. It can be buried in the surface mine pit or it can be neutralized by adding lime. If the toxic material is identified, segregated, and stockpiled, it can easily be placed in the bottom of the pit. There are fewer problems in establishing and maintaining vegetation where potentially high acid-forming materials are covered with soil material favorable to plant growth.

The water-holding capacity of the material is the key to erosion control on most sites. Other soil characteristics that have a strong influence on the erosion potential of a soil are texture, organic matter content, percent slope, and effective length of slope.

Soil texture refers to the size and proportion of particles making up a particular soil. Soil texture classes

Grading for new vegetation — The Princess Susan Coal Corp., Charleston, W.Va.

New life at the Piney Creek Coal Co., Beckley, W.Va.

grading and shaping

are determined by the relative amounts of sand, silt, and clay. If sand is dominant, the soil is coarse-textured or "light" and allows water to infiltrate more rapidly. Too much sand, however, may make the soil too droughty for plant establishment. Clay particles are dominant in fine-textured or "heavy" soils, which are often quite cohesive and slow to erode. Soils high in silt and very fine sand and low in clay and organic matter are generally the most erodible.

Organic matter is plant and animal residue in various stages of decomposition. The organic matter content of a soil has an inverse relationship to erodibility. As the amount of organic matter in a soil increases, the capacity of the soil to absorb surface water increases. As a result, runoff is reduced. Soil materials that result from mining operations are generally lacking in near-surface concentrations of soil organic matter. Deficiencies in near-surface organic matter can be remedied through establishment of vegetative cover and proper maintenance. Superior long-range benefits may be obtained by controlled deep incorporation of organic matter recovered from the original surface soil.

The ability of a soil to hold water depends on texture, soil depth, and organic-matter content. Soils that are able to hold large quantities of water are desirable from a plant growth standpoint, although some clays with excessive holding capacity cause problems.

Grading Considerations

Scheduling and Seasonal Limitations

Seasonal climatic variations play an important role in the scheduling of grading operations. The amount of rainfall and runoff during different periods of the year influences erosion. Because the soil is so vulnerable to erosion during the grading activities, those activities should be scheduled to coincide with the periods of low precipitation. The spring and early summer months often have the highest precipitation rates. Therefore, the bulk of grading operations, especially in critical areas, should be scheduled for mid-summer and fall.

Soil stability is another consideration. Proper compaction cannot usually be obtained during the winter months when the ground is frozen. In early spring the ground is often too wet to be handled properly, and mud can impede the operation of grading equipment.

If there is a choice, it is better to grade during the most favorable time for seeding. From a moisture and temperature point of view, April, May, and June in the spring and late August, September, and October in the fall are the best times to seed for uniform emergence and seedling growth in West Virginia, Maryland, and Virginia.

Topographic Manipulations

The rate of runoff and, correspondingly, the rate of soil erosion can be controlled by manipulating the slope gradient and effective length of slope. Such control is particularly significant in area mining and mountaintop mining.

Slope design should be based on the erodibility of the surface soils, as well as the need to stabilize against mass earth movement. Return to approximate original contour, as required by most state laws, may not be desirable in all cases. A reduction in relief and an overall flattening of the topography is not only desirable from an erosion control standpoint, but may be necessary to convert the site to another type of land use. It must be remembered that shorter and flatter slopes are less erodible.

Where there is little flexibility as to the overall configuration of the slope, as is often the case with contour mining in steep terrain, diversion structures, such as reverse benches or terraces, ditches, and dikes, can be constructed above and along the spoil slopes to decrease the overall length of the slope.

Soil Surface Manipulations

The soil surface can be manipulated to reduce and detain runoff. Manipulation includes roughening and loosening the soil, mulching and revegetation, and topsoiling and adding soil amendments.

A roughened and loosened soil surface improves water infiltration, slows the movement of surface runoff, and benefits plant growth. Common methods of loosening and/or roughening a soil surface include scarification, tracking, and contour benching or furrowing. Scarification is usually accomplished by disking or harrowing on the ground contour, but it can also be done by a crawler tractor equipped with ripper bars or by dragging the teeth on the bucket of a front-end loader over the ground.

Tracking is done on steep slopes where equipment cannot be moved safely along the ground contour. It is accomplished by running a cleated crawler tractor up and down the slope. When this method is used, it is important that the cleat marks overlap. The cleats leave shallow grooves that run parallel to the contour. If the slope is not too steep, furrows can be made on contours by angling the dozer blade. Some overtopping of these furrows occurs, but they help control erosion.

The prompt establishment of a cover of vegetation or the placement of a fibrous, organic mulch on a denuded soil surface also reduces and detains surface flow. Additionally, it stabilizes the soil. Vegetation or mulch protects the surface