and prevents the soil from being compacted and sealed during a rainfall. Live vegetation and mulching materials make the soil more porous and remove soil moisture.

The permeability of the surface soil also has a major bearing on the rate of surface runoff. If the soil remaining after grading is highly impermeable, it may be desirable to top-dress the graded area with a more suitable soil. This process should enhance revegetation efforts. Decreased surface runoff is a secondary benefit.

Commonly used equipment for grading and shaping are dozers, pull scrapers, motor scrapers, trucks, and high lifts. Power shovels, gradalls, and draglines are sometimes used in the backfilling operation.

The types of equipment used influence the quality of the final grading and shaping. Some compaction is needed to improve slope stability. However, the surface or root zone should be loose to permit water movement and good plant growth. The type of equipment used will have an effect on these conditions.

## Guidelines for Grading and Shaping

### Scheduling of Operations

Grading and shaping operations should be scheduled with two objectives in mind. The first objective is to minimize the total surface area disturbed at any one time. The second objective is to schedule earth moving operations which considers seasonal climatic variations. The schedule should require the shaping and grading operations, including seedbed preparation and mulching, to be conducted as a continuous operation during the best seasons of the year.

### Soil Placement

Two major objectives in placing soil materials resulting from mining operations are (1) to provide a stable soil mass and (2) to provide a suitable growth medium. These objectives are extremely difficult, if not impossible, to attain without a thorough analysis of the overburden materials during preplan-

# grading and shaping

ning. This analysis will identify potentially toxic materials that must be buried or neutralized. It will also identify the layer of the soil that would be most desirable for plant growth. The occurrence of ground water, particularly aquifers or springs that might saturate and threaten stability of the soil mass, can also be identified and provided for in the soil reconstruction process. Reconstruction should replace old acid soils with nonacid young soils; provide high levels of available plant nutrients (phosphorus, calcium, magnesium, and potassium); replace hardpans and relatively shallow root zones with deeper soils; and provide boulder-free surface soils.

### Utilization of Existing Materials

Grading and shaping plans should take advantage of materials present at the site. If clayey materials are present in the overburden material, they can be used to segragate toxic soil materials, create an artificial ground water table, and line the walls and bottoms of water-holding impoundments. Large rocks and boulders, which are usually buried, can also be used to anchor the toes of outslopes and stabilize steeply sloping soils. They can also be broken down and used as rip-rap to stabilize slopes, water courses, and outfalls. Nonmarketable woody plant materials, which are also usually buried, can be processed through a wood chipper and used as a mulch. Before a decision is made to discard any material, it should be thoroughly evaluated for possible use.

### Control of Runoff

Grading and shaping are major considerations in the control of runoff. Runoff can be controlled through a combination of surface soil manipulations, topographic shaping, and erosion control structures.

Soil surface manipulations include roughening and loosening the soil, mulching and revegetation, topsoiling, and adding soil amendments. Mulching and revegetation are not strictly shaping and grading operations, but they are generally inseparable from these operations. The shaping and grading operations by themselves cannot do much to prevent rainfall erosion. The impact of falling raindrops can be controlled quickly with mulches and the rapid establishment of grasses and legumes. The preparation of the soil surface through soil surface manipulations will help to keep the mulch in place and establish vegetation.

Topographic shaping is used to control the rate of runoff and to reduce the rate of soil erosion. This objective is accomplished by manipulating the gradient, length, and shape of the slope. In addition, topographic shaping has a major influence on the stability of the slopes. Slope design, therefore, should be based on the erodibility of the surface soils and the stability against landslides.

The grading and shaping operations must recognize the needs of the post-mining land use. These requirements and characteristics vary considerably among the many possible land uses, which include reforestation, recreation, agriculture, and urban development. The elements with the greatest possible variance include slope length and steepness, water supply, storm runoff handling, and selection of plant materials.

### Selection of Equipment

The selection of the proper size and kind of equipment for grading and shaping is important. A large piece of equipment (D9 or greater) provides the greatest capacity to move earth. However, it may not be the most economical for grading and finishing the job to the required standards.

Most successful operators have found that a large dozer (D9 or equal) can be used for backfilling and rough grading. After this stage use of a smaller dozer (D-7 or equal) has proved to be the most economical, mainly because of its greater maneuverability. This smaller size equipment has the capability to final-grade closer to requirements and to construct water disposal measures. Long blades and the overall physical size of large dozers limit their use in constructing these water disposal measures.

Equipment selection is also governed by the distance earth has to be moved. General guides are as follows:

Up to 300 feet—Dozer
300 feet to 1,000 feet—Pull scraper
1,000 feet or greater—Motor scraper

## Applicable Conservation Measures

Numerous conservation measures have been developed to supplement the grading and shaping operations in controlling erosion and establishing effective vegetation. The applicable measures fall into two major categories: measures for runoff control and measures for soil stabilization.

### Measures for Runoff Control

Measures used in controlling runoff can be grouped into three types according to their function. The three basic functions are:

(1) reduction and detention of runoff
(2) interception and diversion of runoff
(3) conveyance of safe disposal of concentrated flow

Measures to reduce and detain runoff include those practices dis-

cussed under surface soil manipulation and topographic manipulation. Included in these practices are:

(a) roughening and loosening the soil
(b) mulching and revegetation
(c) topsoiling and soil amendments
(d) reduction of slope length and gradient
(e) use of concave slopes

Interception and diversion practices are used to intercept runoff before it reaches a critical area and to divert it to a safe disposal area. Interception and diversion practices perform two important functions at surface coal mines. They isolate onsite critical areas (i.e., raw spoils, partially stabilized spoils, highwalls, access roads, and other areas) from offsite runoff. In addition, they control runoff velocities on steep or long spoil slopes and abandoned access roads. Interception and diversion is accomplished through the use of various conservation structures, including reverse benches or terraces, cross-slope ditches, earth dikes, and combined ditch and dike (diversion).

The diversion and the interception of runoff necessitates the conveyance and disposal of concentrated flows. Safe conveyance of concentrated flow requires practices that reduce the velocity of runoff or maintain low velocity, and as a result, control its ability to detach and transport soil particles. In handling concentrated flow, the objective is to safely convey the water without erosion. This is accomplished by designing the measures to withstand the expected velocities. For most vegetated waterways there must be only intermittent flow, and velocity cannot exceed 5.0 feet per second. If greater velocities are expected or base flow or seepage occurs, structural protection is needed such as rip-rap or concrete linings. Other structures such as culverts and chutes can also be used to convey concentrated flows to safe outlets. Temporary storage of runoff in impoundments and energy dissipators (level spreaders, concrete or road blocks, etc.) are other methods that may be used.

## Measures for Soil Stabilization

The second category of erosion control measures is soil stabilization. Soil stabilization practices are designed to protect the soil from the erosive action of rainfall, ensuing runoff, and wind. Stabilization measures can be either vegetative or nonvegetative and short term or long term.

Vegetative stabilization refers to the use of different types of vegetation to protect the soil from erosion. Nonvegetative stabilization, on the other hand, refers to a multitude of practices that use materials other than vegetation such as mulch, gravel, etc. in preventing soil erosion. A combination of both vegetative and nonvegetative measures is usually required. □

# Industry News

## Ohio licensing deadline set

Ohio Governor James Rhodes signed Amended House Bill 1015 on June 2, 1976; it became effective September 1, 1976. This statute establishes March 1, 1977, as the date on which all commercial applicators and operators, including many turf managers and golf course superintendents, must be licensed. The effective date for private applicators is still October 21, 1977.

The Ohio Turfgrass Conference and Show, December 7-8, 1976, will offer an opportunity to obtain training and take the test necessary for licensing. The Program Committee has decided to devote the Thursday morning (Dec. 9) session specifically to pesticide applicator training. The Ohio Department of Agriculture will make the test available Thursday afternoon.

## New purpleosier strain released

The U.S. Soil Conservation Service and N.Y. State Department of Environmental Conservation have announced selection and release of an improved variety of purpleosier willow (*Salix purpurea* L.) for streambank protection and repair in the Northeastern U.S. The shrub also has potential ornamental value along streams.

The new strain, named Streamco, is a vegetative increase from a foundation cutting block established in 1943 from cuttings from a naturalized stand near Montour Falls, New York. Extensive testing has shown Streamco superior to other strains and streambank species in steminess, stem presiliency, suckering, and ease of establishment on streambanks.

Streamco is a medium to tall shrub, 10 to 20 feet high, with smooth, slender, tough, resilient branches. It is a thicket-forming shrub that suckers profusely from its roots and spreads by layering of branches. Mature height is reached in five years.

Foundation cutting stock will be maintained by the Soil Conservation Service Plant Materials Center, Big Flats, N.Y., and Saratoga Nursery, operated by the N.Y. State Department of Environmental Conservation, Saratoga Springs, N.Y. Detailed information on test results and applications as well as foundation stock are available to commercial nurserymen from the Soil Conservation Service Plant Materials Center, P.O. Box 295, Rt. 352, Big Flats, N.Y. 14814.

## Dow to produce MCPA, MCPP acids

Dow Chemical U.S.A. announced that it will begin production this fall of MCPA and MCPP acids, raw materials for the manufacture of phenoxy herbicides.

Dow currently markets MCPA amine herbicide and will produce the acid not only for its own use but also for export. The MCPP acid, used mainly in lawn and turf herbicides, also will be produced for export.

Production capacity for the two products has been obtained through modification of existing facilities in Midland, Mich., following startup earlier this year of the company's new 2,4-D plant. **Continued**

# EDITORIAL QUALITY CONTROL AUDIT

Help us tailor WEEDS TREES & TURF to your needs. Please fill out the following questionnaire then fold and staple with the return address on the outside. Postage is prepaid.

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3. Number of people on your staff? _____

4. What training have you received for your profession?
   High School _____ College _____ Other_____

5. Have you taken supplementary courses? If so, please list them.

   _____

   _____

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6. What sources do you use to keep up with new developments in your field?
   - ☐ University bulletins
   - ☐ Trade Association bulletins
   - ☐ Newspapers
   - ☐ Trade Magazines

7. Which are the most helpful? _____

8. Which of the following trade publications do you read?
   - ☐ GROUNDS MAINTENANCE
   - ☐ TURF-GRASS TIMES
   - ☐ LANDSCAPE INDUSTRY
   - ☐ THE GOLF SUPERINTENDENT
   - ☐ WEEDS TREES & TURF

9. Which one is the most useful to you as a professional? _____

   Why? _____

   _____

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   _____

over

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*continued from other side*

10. In your opinion, what areas should WEEDS TREES & TURF cover?

_____

_____

11. What specific subjects would you like WEEDS TREES & TURF to cover?

_____

12. What kinds of articles will help you do your job better?

_____

13. What do you see as the possible major developments in your field in the next two years?

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Attn: Gail D. Hogan - Editor

14. Please rate the articles in this issue. Articles titles are listed along the side of the chart. On the top are specific qualities. Fill in each box across from the articles with your evaluation for each quality.

G = Good F = Fair P = Poor

| Article title | Article Contains Useful or Original Information | Points are Clear and Easily Understood | Article is Useful to Me as a Professional | Article is Interesting to Me as a Professional | Article is of No Interest or Use to Me as a Professional |
|---|---|---|---|---|---|
| Over Seeding by Helicopter | | | | | |
| Why a Fertilizer Burns | | | | | |
| Grading and Shaping for Erosion Control | | | | | |
| Planning a Golf Course | | | | | |
| Cabling and Bracing Trees | | | | | |
| It's a Jungle Out Here (Park Irrigation) | | | | | |

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(8) Golf Course
☐ Superintendent
☐ Owner
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☐ Other _____ (please specify)
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(20) ☐ Industrial Research
(21) ☐ Institutional Research and Teaching
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(8) Golf Course
☐ Superintendent
☐ Owner
☐ Club Manager
☐ Greens Chairman
☐ Other _____ (please specify)
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## Industry News

**Continued**

### Monsanto opens new Lasso plant

Monsanto Agricultural Products Company, manufacturer of Lasso, has announced that a new facility for production of the herbicide will be opened within two months at its Muscatine, Iowa plant. R. J. Mahoney, managing director of this division of Monsanto Company, cited rising market demand for Lasso. The new facility will increase production capacity by 40 percent.

At the same time, Monsanto announced an 8 percent price increase for its Lasso and Ramrod herbicide products, effective immediately.

Mahoney also noted that Monsanto again plans to begin shipments of Lasso and Ramrod herbicides in the fourth quarter of this year.

### A.A.N. offers directories

The American Association of Nurserymen has published two directories for nurserymen. *Sources of Plants & Related Supplies* is an annual publication containing 7,000 listings of more than 1,600 varieties of commercially available nursery stock, related nursery supplies, retail products, specialties, and business services.

The 1976-77 edition of *Sources* shows type of stock i.e., liner, bare root, balled and burlapped, container, and whether packaged for retail. In the case of supplies and equipment, the directory shows whether the firm listed for a particular item is the manufacturer or distributor. The book includes a company index showing the name, address, and phone number of each firm appearing in the 1976-77 edition.

The *1976-77 Member Directory*, is a 75-page book which includes the rosters of the American Association of Nurserymen, Garden Centers of America, Horticultural Research Institute, National Association of Plant Patent Owners, Na-

**Continued**

## Industry News

**Continued**

tional Landscape Association, and Wholesale Nursery Growers of America, as well as listings for regional and foreign nursery associations and related industry organizations.

Listings are arranged alphabetically by state, and include firm name, address, and phone number; key contact; AAN dues classification; and nursery business code i.e., whether the firm is a grower, retailer, mailorder nursery, landscape professional, or dealer.

A free copy of each publication has been sent to each AAN member. *Sources* is available to non-members at $3 per copy. Additional copies of the directory may be purchased by members for $5 each, and by non-members for $8 each. Both books are available from the American Association of Nurserymen, 230 Southern Building, Washington, D.C. 20005.

### Grower policy manual released

The Wholesale Nursery Growers of America has released the second in a series of management publications for the wholesale grower.

Wholesale Nursery Grower Policy Manual: A Preparation Guide presents a range of policy options drawn from manuals used successfully by nurseries nationwide from which growers can develop their own manuals.

The guide covers such subjects as working hours, pay periods, wage and salary advances, inclement weather policy, profit sharing, retirement and savings plans, safety regulations, and much more. Copies are available from Wholesale Nursery Growers of America, 230 Southern Building, Washington, D.C. 20005, at $5 each.

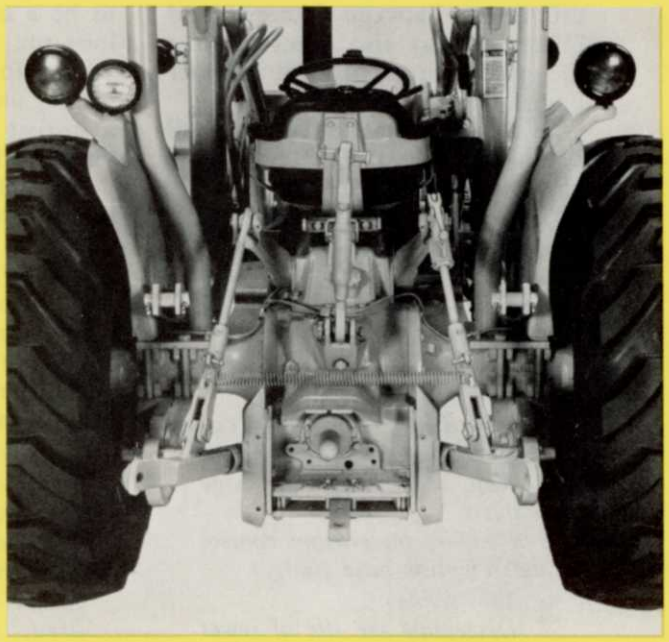
The first volume in the series, entitled A Company Conversation, is a how-to guide on preparing an employee newsletter; it is available from WNGA at $2 per copy.


# At the working end, John Deere has the competitive edge

With utility tractors, getting work done is more than a matter of horsepower. The difference lies in how easy it is to get the work done. That's where John Deere Tractors in 43-, 50-, and 62-horsepower sizes invite comparison.

The 3-point hitch on all John Deere utility tractors and loaders has features not available from competition, including a Load-and-Depth Control system with easy-to-operate single-lever control quadrant; one set of sway blocks that handle Category 1 or 2 attachments in any position; and vertical float for gauge-wheel-equipped tools. You can even mount a backhoe without rockshaft interference.

Whether you're mowing, seeding, spraying, landscaping, etc., John Deere's 3-point hitch system can help get the work done more efficiently. Your local dealer can give you a complete list of features and equipment available on John Deere utility tractors and loaders. John Deere, Moline, Illinois 61265.



Draft links can be one-piece or telescoping. They are easily adjusted and the leveling crank can be locked.

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JOHN DEERE

**JOHN DEERE on the move**

# PLANNING A GOLF COURSE

## by Edwin Seay

To build and maintain a quality golf course and overall recreation facility, there is no substitute for proper planning. Whether it be the development of a new course or remodeling and updating an existing course, an early comprehensive Master Plan is essential.

If you were building a house, you wouldn't construct it room by room as you need the space. You would carefully decide what type of home would meet your needs, leaving options open for later changes or expansion. The same principle holds true for golf courses.

The early retaining of a golf course architect as a member of the consulting team can often make the difference between success and failure. It may also affect whether the project can be brought in under budget.

The following steps are all essential as part of the Master Planning phase:

*1. Arrange for take-out and permanent financing so the project has ample funds for completing construction and for first-year maintenance.*
*2. Conduct an environmental impact study.*
*3. Conduct hydrological studies and make a flood report.*
*4. Run soil tests and slope analysis.*
*5. Conduct an erosion control and retention base study.*
*6. Test well(s).*
*7. Determine the site of sewer treatment plant, if required.*
*8. Conduct a tree study.*
*9. Determine the direction from which the facility will be served with utilities (electricity, gas) and drinking water.*
*10. Conduct a space analysis and determine preferred locations for the clubhouse, parking, maintenance, and supplemental recreational facilities like tennis courts, bathhouse and pool.*
*11. Determine the traffic circulation system and effects of and upon nearby residential developments.*

The golf course architect can't make all the decisions about the building of a course, but along with members of the team, the architect can make the difference between a mediocre course and a great one.

And to keep a course at a high level of quality, the planning doesn't end when the facility becomes playable. Updating and remodeling have to be a continuing project. In the long run, continuous planning and supervision is less expensive than waiting until a course deteriorates to a point where it has to be remodeled.

Too often courses are remodeled in a haphazard way with no consideration of the effect on the overall facility. There is no better way to ruin a good course than hit and miss renovations.

Several steps should be taken as part of a remodeling program to insure the best results. They are:

*1. Consult the golf course architect to gain his expertise in the project.*
*2. Obtain an up-to-date topographical map of the entire golf course and clubhouse grounds area, showing all physical features (buildings, roads, parking, trees, water, etc.) as well as greens, fairways, sandtraps and topography.*
*3. Obtain an up-to-date aerial photo of the course at same scale as 2 (one inch = 100 feet).*
*4. Meet with the architect and course committee to decide upon desired improvements.*
*5. Review the architect's improvement plan and make revisions to conform with your group's wishes.*
*6. After finalizing the Master Plan, have it adopted by your board of directors.*
*7. Have your architect provide you with an itemized cost estimate for the plan on a hole-to-hole basis.*
*8. In consultation with the architect, develop a priority schedule in manageable phases extending over two or three years.*
*9. Ask your board of directors to fund or budget the required money each year covered by the agreed-upon plan.*

I can't emphasize enough the need for regular modernization of courses. I would estimate that at present as many as 50 percent of the courses in the U.S. are in need of some kind of remodeling. Adoption of Master Planning techniques can save these courses a lot of trouble in the future.

Proper planning can be financially beneficial as well as offering a great opportunity to keep facilities at a high quality level. For more information about Master Planning or for a list of golf course architects, contact the American Society of Golf Course Architects, 221 N. LaSalle St., Chicago, Ill. 60601. □

*Mr. Seay is president of the American Society of Golf Course Architects.*