What is there to weed control besides just killing weeds?

Maybe the area to be treated is already weed-free. Or maybe it's infested with established weeds. Perhaps the weeds are annuals. Or deep-rooted perennials that ordinarily are more difficult to control.

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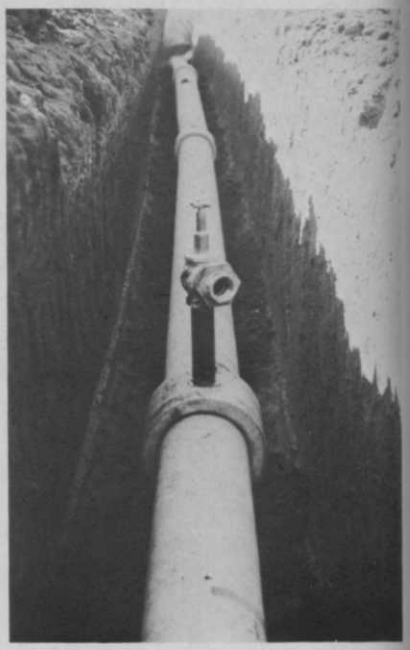
Pumping station on Calabasas Course is capable of supplying 1800 cpm from three 550 gpm pumps and one 150 gpm pump. Pumping units operate on a pressure coll or demand system and are lake fed.



After final grading, 5 miles of transit main line 6-inch pipe such as this was trenched in.

the sand. The greens were planted with Penncross bent grass.

On the fairways the turf was stolonized with Tifway #419 hybrid bermuda and the roughs were seeded with Kentucky blue grass applied in a slurry mixture. The erosion banks were also seeded with the slurry technique.

Germination of the planted turf was an early test of the irrigation system and started June 4, 1967. This crucial period extended through late August. The stolonized turf required roughly 4 times the normal amount of water to maintain an existing turf, and the dependability of the Buckner system proved itself in the resulting turf.

On greens and tees, periodic misting of the areas proved most successful according to Superintendent Little. The system was set to operate during all the summer daylight hours. Little chose to irrigate 2 minutes per hour each day through the germination time, and has reaped a gourd-green, healthy turf from his precisely controlled irrigation.

After the course is open for play, the adaptability of the Buckner Irrigation System will be extremely valuable again, according to Little. Quick economical adjustment of irrigation control can be made easily to meet watering requirements of the course according to the amount of play it receives, mowing schedules and the quality of play. Initial plans call for watering greens every night and fairways every other night.

Trees were planted throughout the course from existing trees on the property. There were many conifers — some 25 feet high—and some were a backdrop for Robin Hood in the films of yesterday.

Nursery trees, eucalyptus, flowering plum, liquid amber, and varieties of oak were also planted as part of the overall landscape design. Along with the lush fairways, greens, tees and roughs they create a green carpet that reaches to rugged background hills. Calabasas Golf Course is truly a magnificent example of the results of combined expert design, irrigation and installation technology in the west.

Once established, lush carpet of fairways, greens, and tees reach to rugged background hills. Course is example of how 150-acre area can be transformed into a championship type golf course.

Irrigation Roundup

tips from specialists in the field to 3000 golf course superintendents at the GCSAA 39th International Turfgrass Conference and Show

Cost Analysis:

Garold M. (Jerry) Murphy, superintendent, Somerset Country Club, St. Paul, Minn., reported on the 1967 conversion of a quick coupling system at his club to an automatic Toro Varitime satellite system.

For GCSAA members, he presented an analysis of the costs and general operating experiences with the new system. His own time in operating the new system requires 5 to 10 minutes once or twice weekly. This is spent adjusting the master controller to adapt to changes in weather and spot checking of satellite control dials.

Sprinklers for the system are gear driven and make the complete revolution in 3 minutes. This, Murphy pointed out, is adequate for relief of stress under the Somerset course conditions. This also permits timing syringing to suit play and results in minimum interference with golfers.

Operating costs presented in the table include electricity and lubricant for the pump and gas and lubricant for the patrol vehicle. It does not include repair or depreciation. Cost for the 2 systems is comparable. The slight difference in favor of the automatic system probably is valid, since night watering can be completed in 12 hours as compared to the 14 hours formerly needed with the quick coupling system. Major operating cost, Murphy said, is for electricity.

Table 1. Cost of Operation—Quick Coupling Vs. Automatic.

	Quick Coupling			Automatic		
Hours	July	Aug.	Sept.	July	Aug.	Sept.
Operation—System	300	250	140	300	260	140
Labor—Night watering	200	180	140	0	0	0
Syringing	100	70	0	35	20	0
Cost						
Operation—equipment	$ 720	$ 570	$ 220	$ 600	$ 540	$ 180
Labor at $2.00/hour	600	500	280	70	40	0
Total	$1,320	$1,070	$ 500	$ 670	$ 580	$ 180

Three Months' Totals	
Quick Coupling	$2,890.00
Automatic	1,430.00
Savings	$1,460.00

Some cost benefits of the automatic system are difficult to assign a monetary value, Murphy reported, but they do exist. He enumerates them as turf benefits and as people benefits. He suggested that superintendents might assign their own dollar value to these (Tables II and III).

In general, Murphy said, the savings in labor and operating costs are significant and impres-

Table 2. Turfgrass Managament Benefits—Favoring Automatic.

1. More efficient use of water.
2. Precise control of water.
3. Water conservation.
4. Minimum loss of turfgrass.
5. Less wear and tear on turfgrass.
6. Easy to remove dew and frost.
7. Easy to water in fertlizer.
8. Less down time associated with sprinkler repair.

Table 3. People Benefits—Favoring Automatic.

1. Golfer satisfaction.
2. Happier crew—no one assigned night duty.
3. Smaller more efficient crew.
4. Less vandalism.
5. Shop is locked at night.
6. More favorable comments on condition of golf course.
7. Peace of mind—Superintendent.

sive. Of even greater importance, he believes, especially to himself and the Club, are the benefits related to golfer satisfaction.

Irrigation System Design:

Chances are, when you invest in an automatic irrigation system you are going to pay the same price as a good, well planned system would cost. Why not insure that you will get what you pay for? This is the opinion of Richard R. Abernethy, Telsco Industries, Dallas, Tex.

Abernethy, in presenting the official GCSAA Golf Course Irrigation questionnaire to GCSAA members for help in planning and designing custom irrigation systems said that the trend today is toward "turnkey" design and installation. This type system, he said, is done by competent, specialized golf course contractors. Such firms today are well capitalized, employ engineering personnel for both design and construction supervision, and have the specialized equipment to do the job right.

Tremendous responsibilities are placed on the superintendent by members and directors for the success of a system which is a major investment. Abernethy points to the questionnaire as a means of covering, in practical language, all the major areas necessary for the irrigation designer to prepare an authentic, accurate and practical estimate of individual irrigation needs.

No one knows the course better than the superintendent, Abernethey implied. He pointed out that water requirements vary from one geographical area to another. Fairways, greens and tees require special consideration, especially for drainage and wind problems. Only the superintendent knows how often the course requires hand or supplementary manual watering. Thus, he believes that the questionnaire provides the "common denominator" which will enable the superintendent to (1) better evaluate the job, (2) communicate the facts to the decision making administration, and (3) better understand the finished product or design when the final plans are presented for approval.

This approach, Abernethy said, can save money.

Primary Decision Making:

Engineer Don A. Hogan, D. A. Hogan & Associates, Seattle, Wash., presented the 3 common approaches to the problem of golf course irrigation design and installation and the problems associated with each. First, Hogan said, is the "package deal" or the "turnkey job." This is attractive, but Hogan pointed out, leaves the club somewhat vulnerable because the seller determines amount and quality of work and material, while the owner does

GOLF COURSE IRRIGATION SYSTEM CHECK LIST AND PLANNING GUIDE

Name of Course_____
Address _____
Phone _____

Superintendent _____
Club Official _____
Architect or Engineer _____
Address _____
Phone _____

1. Plot Plan available? _____
2. Topographic Map available? _____
3. Number of holes—9 _____ 18 _____
4. Type of system desired—Fairway _____
   Tee & Green _____
   Fairway, Tee & Green _____
5. Total yardage of course _____
6. Fairway width _____
7. Fairway turf _____
8. Greens turf _____
9. Type of soil—Sandy _____ Loam _____
   Clay _____ Rocks _____
10. Sod removal—All _____ None _____
    Club handles _____
    Contractor handles _____
11. Ground water table _____
12. Available water supply _____
13. Contemplated water supply _____
14. Lagoon or reservoir data _____
15. Prevailing wind direction _____
    @ _____ mph _____
16. Type of system desired:
    Quick coupling valves _____
    Rotary Pop-up _____
    Automatic _____ Manual _____
17. Special instruction greens:
    Pop-up ____ Manual ____ Automatic ____
    (a) Pop-up with quick coupler for supplemental hand water _____
    (b) Valve leeward and windward heads separately _____
18. Total time desired for weekly watering program _____
19. Desired inches precipitation per week:
    (a) Fairway & Tees _____
    (b) Greens _____
20. Any special operational desires _____
21. Desired time to start installation _____ (Date)
22. Desired completion _____ (Date)
23. Type of pipe desired:
    (a) Main lines: A.C. _____ C.I. _____
    Other _____
    (b) Laterals: PVC _____ Copper _____
    Galvanized _____
24. Location of pumps and pump house _____
25. Location and availability of electrical power supply _____
26. If automatic, desired location of controls _____
27. Design Check List:
    1. Aerial photo required—Yes ____ No ____
    2. Field check to confirm measurements—Yes _____ No _____
    3. Preliminary plan approval—Yes _____ No _____
    4. Final presentation complete plans & specs—Yes _____ No _____

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not have an experienced person protecting his interests. Normally, design and materials are limited to a single representation. And, Hogan said, it is not probable that architectural professional ethics can be completely divorced from the influence or effect of the contract profit aspects.

The second approach is the combination of design and materials supplied by one firm and a separate contract for installation, or where the owner installs the system. This method, according to Hogan is normally less costly. Here, again, he said, lack of construction coordination may result unless the owner has an unbiased, experienced representative to supervise and coordinate the project. The term "design" as applied usually covers only a simple drawing or layout. Other engineering requirements must be performed in conjunction with the basic layout.

The 3rd approach by Hogan was the professionally designed system by a qualified engineering firm, combined with the installation being performed by the successful bidding contractor. In this case, the contractor's work is supervised and inspected by the engineering firm who represents and protects the interests of the owner. Hogan, an experienced engineer in the business, believes a private engineering firm paid directly by the owner is the best arrangement.

The team approach, in the belief of Hogan, can result in the most satisfactory system. He lists team members as follows: (1) club committee, (2) golf course superintendent, (3) professional designer, (4) installation contractor, and (5) material suppliers.

Each member group on the team needs specific qualifications and has definite responsibilities, Hogan said. The club committee is first. This group needs to be dedicated and willing to devote time and effort. They must work directly with the golf course superintendent and engineer.

The golf course superintendent is a vital team member. His knowledge of the course and turf management will influence the type of system to be approved. He must present operating costs in conjunction with the engineer, work out completion schedules, and see that future plans of the course are in line with the new system, plus a myriad of other details which must be coordinated with the entire team.

The 3rd member of the team, the professional designer, must work closely with the club committee and superintendent in a detailed design. This will include all construction details and specifications, prepared for bidding and construction control purposes. He must screen bids, approve materials, monitor construction work, and perform necessary tests, in detail, of the installed system. Finally, upon completion, he must certify the installation and furnish operating instructions and "as-built" drawings.

Job of the contractor as a team member is to install the system in a workmanship manner in complete accordance with the specifications. He must use quality materials and equipment, and supervise the project, at the same time working closely with the superintendent to familiarize him with operation and maintenance.

Material suppliers must provide data on materials and equipment, assist the contractors in bidding, coordinate delivery of materials, instruct the construction crew, assist in final adjustment and testing, and generally service their products.

Because of the magnitude of the modern irrigation system, Hogan pointed out that it warrants the best possible development. It is a serious mistake, he said, to settle for less.

Tree Planting Review

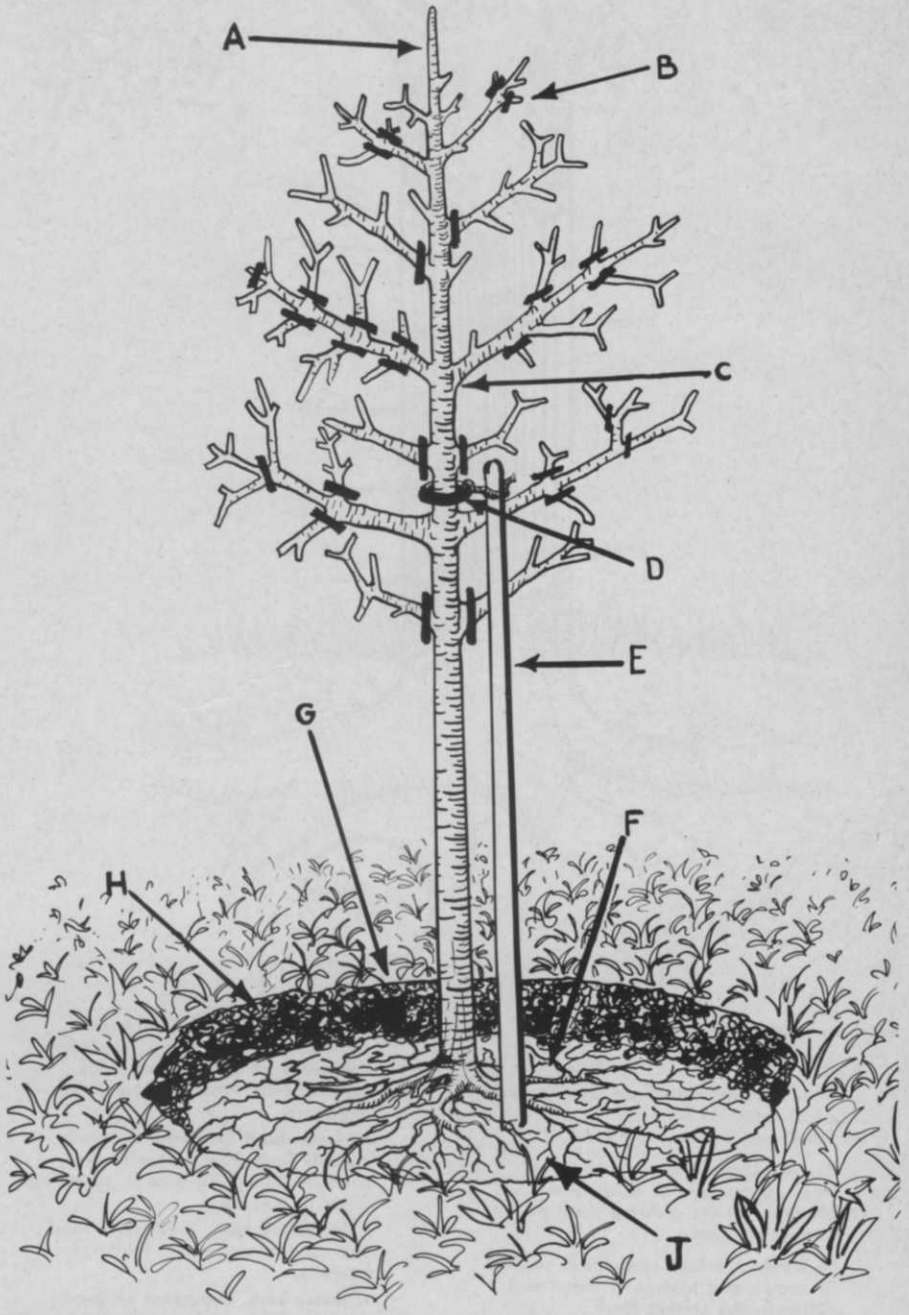
check list for new employees

TREE CARE MEN have to answer lots of questions. During tree planting operations, passersby and buyers become literal sidewalk superintendents. Questions as to why medium-sized and dwarf species are best for streets and ranch-type homes need answers. This is good for the industry.

At the same time, the tree man must be prepared to astutely discount the value of old, favored, but less desirable trees. For example, he must explain why Chinese and Siberian elms, poplars, willows, silver maple, boxelder, and others are not suitable. Though fast growing, they are relatively short-lived. Also, their brittle wood is susceptible to storm damage, roots invade underground pipes, and they are subject to pest and disease attack. A learned explanation assures the onlooker and promotes the professional care business.

Further, careful planting can build business. It does much to increase the percentage of trees which survive a move. This is especially true of wilding trees. Nursery stock is usually much easier to handle.

Most tree men prefer nursery stock, either that grown by themselves or purchased from a reputable operator. Nurseries generally offer a large selection of sizes and species. When compared to wilding trees, the nursery trees will have better root and crown systems, will become established more quickly, and are more likely to live.



A. Well developed head with strong leader, branches set at wide rather than close angles.

B. Before setting, tree should be pruned at points indicated by black lines rather than clipping the ends of branches.

C. Base of permanent crown should not obstruct walks or roadway.

D. Loop brace needs to be loose, pliable. Remove after the tree becomes firmly established.

E. Stake, 2½ inches by 10 feet in height, needs to be driven into ground and secured with rubber covered wire or canvas.

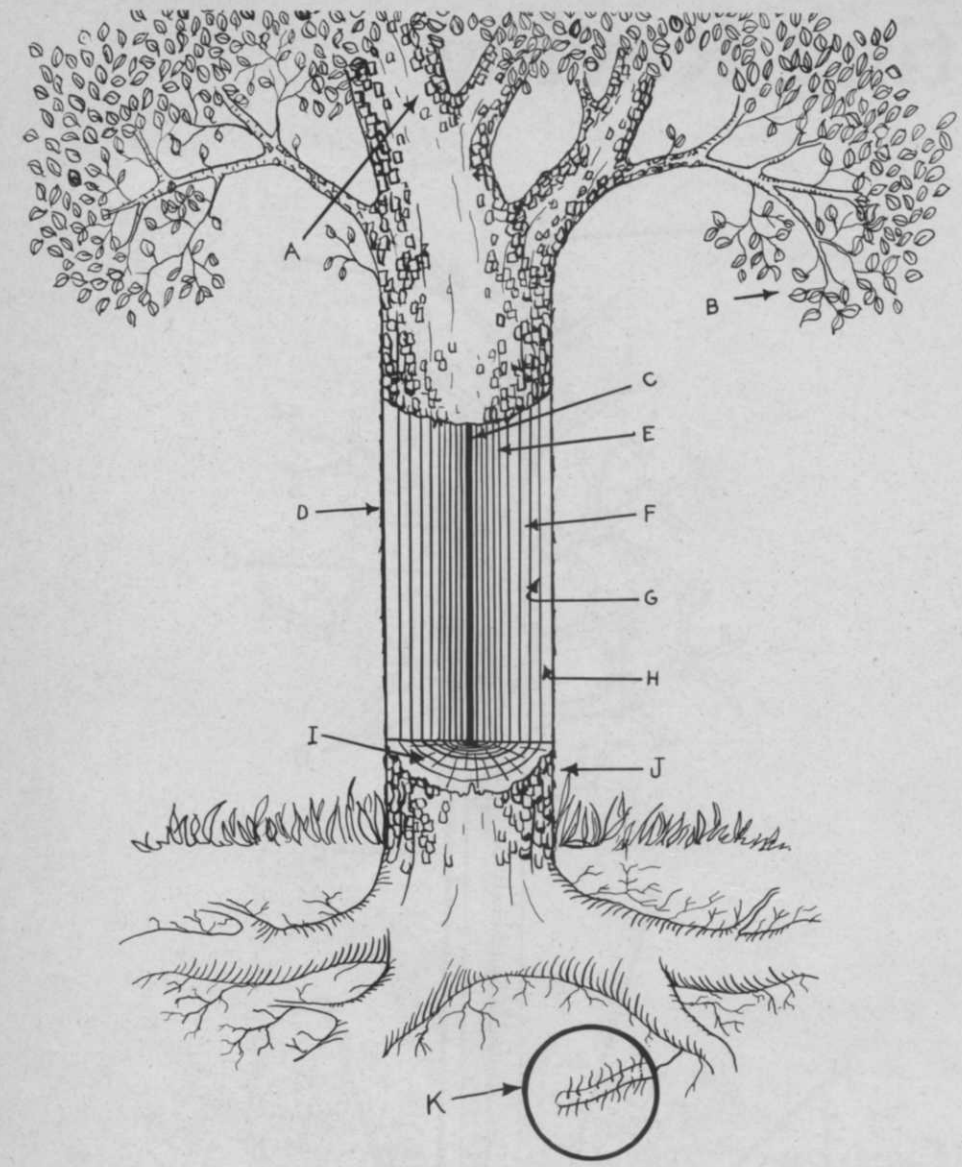
F. Preserve all fibrous roots possible. Remove broken roots with a clean cut.

G. Dig hole at least 2 feet in diameter and 18 inches or more in depth.

H. Fertile soil needs to be packed firmly about roots and the hole filled to original soil level on trunk. Keep the soil surface pulverized.

J. Set tree 2 inches deeper than it was originally in the nursery. Fill hole to the lower root level with a 3:1 mixture of good soil and peat moss.

When wilding trees are used, they need to be dug in open rath-



Functional Tree Parts

A. Crown.

B. Leaves. With sunlight these convert carbon dioxide from the air plus "raw" sap into useable food.

C. Pith. Located at very center of trunk. Composed of tissue which is produced at the growing point of the elongating stem.

D. Trunk. Provides mechanical support for crown and transports water and nutrients plus storing food manufactured in leaves.

E. Heartwood. Composed of dead cells and main function is support.

F. Sapwood (xylem). Conducts "raw" sap from the roots to leaves. Consists of both living and dead cells.

G. Cambium. Located between sapwood and inner bark or phloem. Composed of a thin, continuous layer of cells. Produces new wood and bark.

H. Inner bark (phloem). Conducts useable food from leaves to the cambium to nourish tree or to storage areas in the wood.

I. Medullary rays. These store food and conduct water and food laterally.

J. Outer bark. Composed of dead cells. Insulates and protects inner tissues from disease, infections, and drying.

K. Roots and hair roots. Hair roots absorb water and mineral salts from soil. Larger roots anchor tree and store nitrogen and carbohydrates.

er than wooded areas. When possible, pick trees from areas where soil is rich and deep. Trees growing from sprouts or in clumps should not be used. Also, with wilding trees, save as much of the fibrous root system as possible. A tree not more than 10-12 feet in height is a good size to plant.

Trees larger than 12 feet can be successfully transplanted. But such trees require the extra care gained by experience. Special methods and heavy equipment are also needed. Small trees, those 6-8 feet in height and about 1½ inches in basal diameter, can be dug and moved immediately. Larger trees, 10-12 feet in height and more than 2 inches in basal diameter, respond best when root-pruned a year before moving. Make the root-pruning cut about 6 inches away from the tree for every inch in diameter of the trunk. Remaining roots then form a compact fibrous root system ahead of moving the following spring.

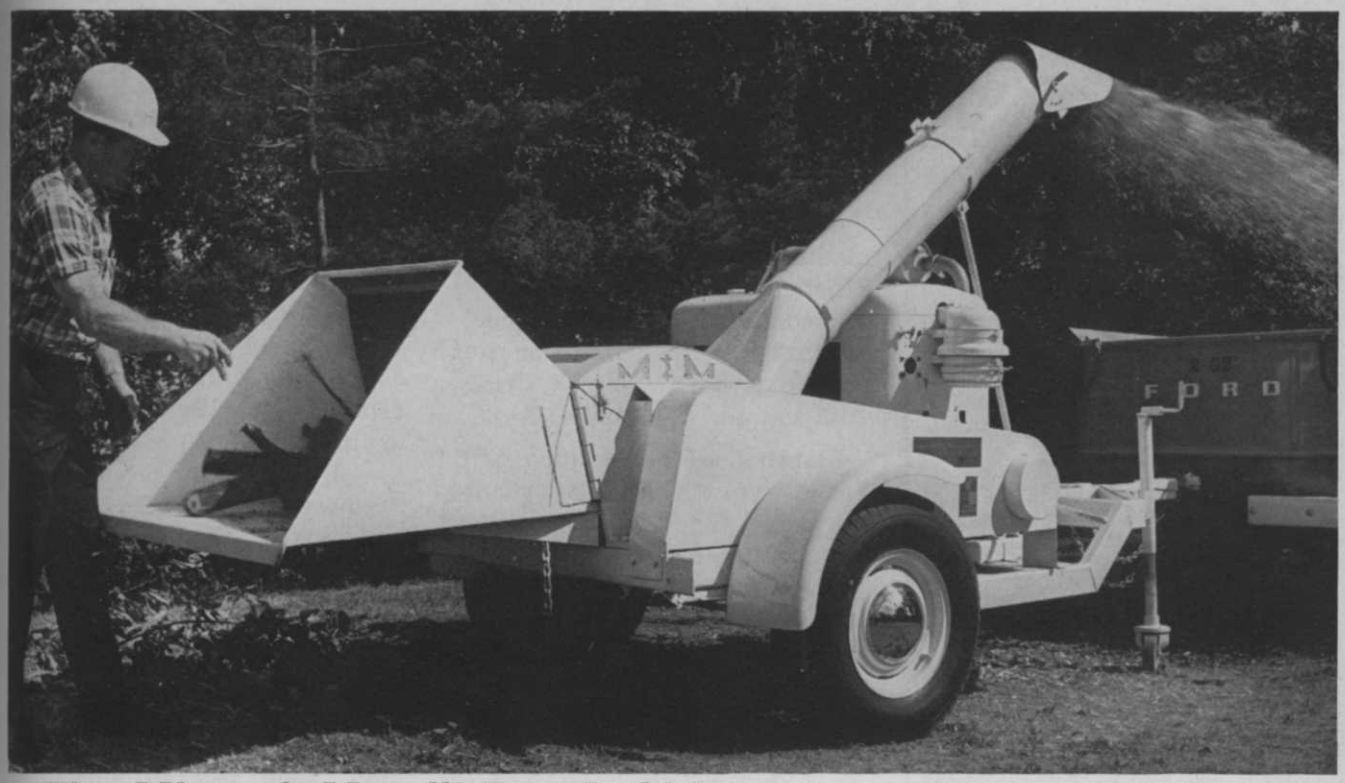
Large Trees Can Be Successfully Transplanted

For even larger trees, those with basal trunks of more than 3 inches, root-prune for 2 years and move the 3rd year. In the first year, root-prune only part of the way around the trunk. Do the final root-pruning the 2nd year and then move the tree the next season. Though this is seldom practical, it is safest and will pay dividends in livability.

Evergreens are dug the same as hardwoods, making full use of the soil ball. However, evergreens need not necessarily be root-pruned prior to digging. When moving trees with a soil ball, work burlap well up and around the ball. Tie the burlap at the top of the ball so that it holds the soil securely in place.

Hardwoods may also be dug with roots bare. When this is to be done, dig around the tree carefully and cut the roots. Use a spading fork to loosen soil. Do this by gradually working the soil away from the roots. Start at the outer edge where the cut has been made and work toward the tree. In moving trees with bare roots, place peat moss and burlap around the root system. In all cases, keep roots moist until planted.

Best tree planting time is spring, during the dormant stage



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before the buds break. Trees are also easily moved during fall months, from leaf-coloring until freezing weather.

Once dug, trees need to be planted as soon as possible. When stock cannot be planted immediately, it needs to be heeled in by setting roots or soil ball in a hole, covered firmly with soil and kept moist.

Planting sites are important. Street trees do best when planted inside the sidewalk, rather than between walk and curb. The exception to this, of course, is when there is a wide area available between walk and curb.

Before planting, carefully consider the size of the fully matured tree. Trees need to be set 30 feet from structures and 50 feet apart. Make the hole deep enough and with sufficient width to receive the root ball without crowding roots. It is wise to dig a larger hole than needed and to refill excess space with a mixture of well-rotted manure, compost or peat moss, and rich loam. Trees need to be set about 2 inches deeper than they were in their original site.

When planting, remove burlap from ball or lay it flat in the hole. Spread all roots in a natural position. When this is not done, girdling roots may result and kill the tree. Jagged, broken, or badly injured roots need to be cleanly cut above the injury Save as many small, fibrous roots as possible. Fill the hole in steps with a mixture of soil, rotted manure or peat moss. Tamp slightly and water as more fill is added. This forces soil around the roots and prevents air pockets. Leave a small depression around the tree to catch as much water as posible.

Stake the tree with loops which are attached loosely. Canvas or other pliable material such as a section of rubber hose works well. Do not use anything which will injure the bark. Commercial loops can be purchased. Also, a recheck to see that stakes are holding the tree in a rigid position is worthwhile. Water as conditions warrant.

In the case of hot or particularly drying weather, the prepared anti-drying mixtures or waxes may prove profitable. These permit the tree to become established without too much drying out.

Hardwoods Need To Be Pruned Before Planting

Top-pruning is a must for hardwood (deciduous) trees. This offsets root loss which results from digging and moving. Nursery trees, because they have been root-pruned prior to digging, need less pruning than wilding trees which are dug and immediately planted.

Pruning needs to be distributed over the tree rather than just removing the ends of all limbs or removing all the branches on the lower half or third of the tree. Remove interfering limbs. Space limb crotches so that plenty of space is left for each remaining limb. Cuts should be flush for rapid healing of pruning wounds. Never cut back the leader unless one of the laterals in the top whorl is also removed. Otherwise, an undesirable forked tree will result.

Evergreens are seldom pruned except when root loss is severe. In such cases, remove some of the past year's lateral growth. Do not prune off entire limbs on evergreens or the natural form of the tree will be destroyed.

Recommendations for this WTT Tree Care Report are based on technical material of the Maine Forest Service. Illustrations likewise are based on Maine recommendations for planting and care of shade trees and supplied by Maine State Entomologist Robley W. Nash, Augusta.