1978

Winter 1978

William Emerson

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TURF BULLETIN

MASSACHUSETTS TURF AND LAWN GRASS COUNCIL
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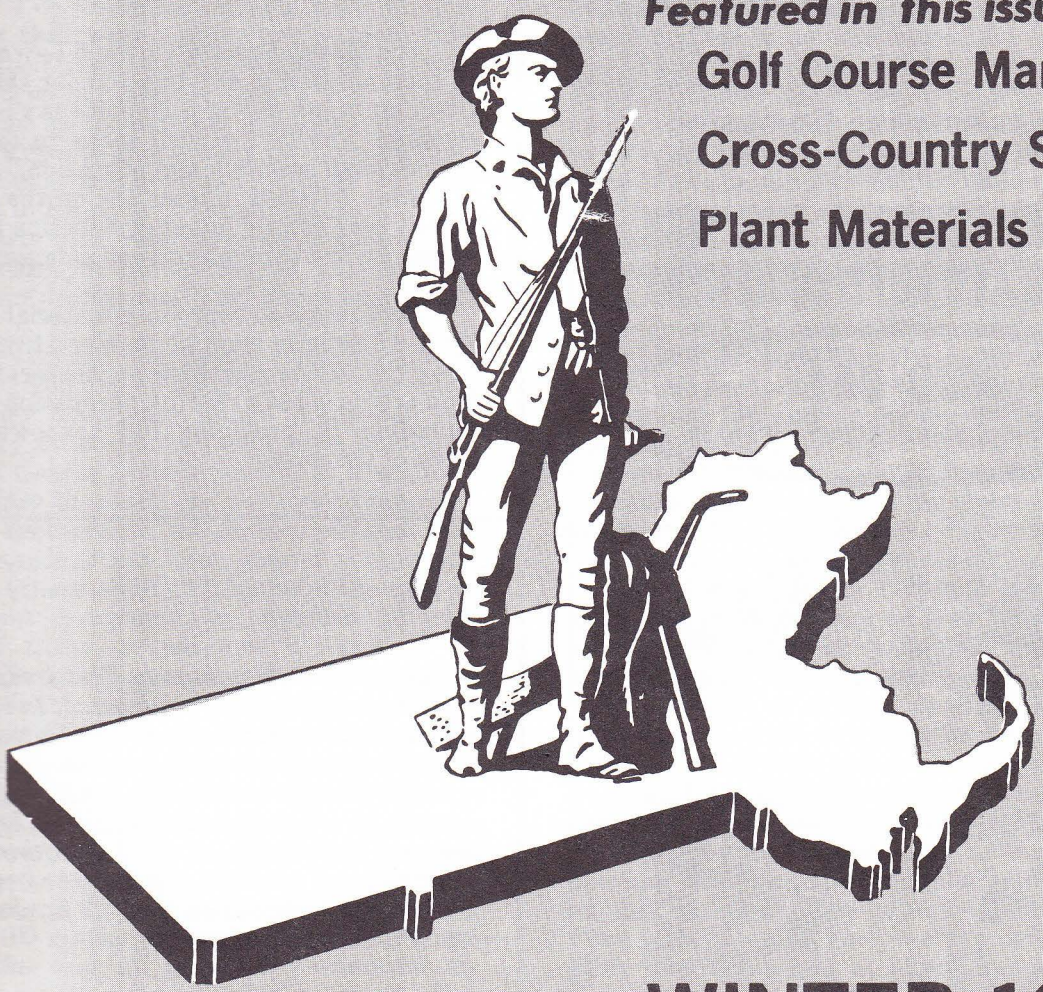
Golf Course Management

Cross-Country Skiing

Plant Materials



WINTER 1978

BETTER TURF THROUGH RESEARCH AND EDUCATION

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The Massachusetts Turf and Lawn Grass Council Incorporated is chartered under the laws of the Commonwealth of Massachusetts as a non-profit corporation. The turf council seeks to foster "Better turf through research and education."

More detailed information on the subjects discussed here can be found in bulletins and circulars or may be had through correspondence with the editor.

Editors Note: *This being my first issue of the Turf Bulletin confusion was confronted. In trying to pick articles for this publication I was instructed to eliminate the popular magazines which you already have read and also the scientific journals which to myself are troublesome to understand. This left me in a dilemma. I hope this first issue is informative to you and I request your reactions to the articles within. Also any suggestions on possible future articles and topics would be welcomed.*

Pat Kristy

The Psychosociological Approach to Golf Course Management

By William Emerson
Golf Course Superintendent
Chevy Chase Country Club

A topic I feel I can talk to you about with conviction is "The Psychosociological Approach to Golf Course Management"—What in the hell is that your asking—well the title is a bit off-the-wall!!, but by definition—Psychosociologic is the blending of psychology—the science of the mind—why a person acts, thinks, or feels as he does with sociology the science that deals with man's relationship towards his fellow man such as in work, crime, poverty, church, school or more basic, how man relates to groups.

What I would hope to communicate to you is that your relationship with your employer, employees, educators, suppliers, peers and your family will have as much to do with your success as a Golf Course Superintendent as the Fine Turf Grass you'll be producing.

In my twenty-one years of involvement within this profession I've seen for myself Golf Course Superintendents that were quality professional turf managers lose good positions not because of the turf grass they produced but because their use of psychosociology was poor or non-existent in many cases.

I'd like to try now to give you my thoughts on How a Golf Course Superintendent can practice and use Psychosociology to his or her best advantage.

Let me start with your psychosociological approach to your employer and employees. They are the major keys to your professional Turf Management success.

During my years as a Golf Course Superintendent, I have found that Golf and or Country Clubs are much like people.—They have many things in common yet they are all very different. In fact I have been employed as a Golf Course Superintendent at five Clubs in my career—four of which are not more than fifty miles from one another and yet each experience I've had as Superintendent has been almost completely unique from the others—WHY? Because of the soils or turf management programs—or because of the number of Golf Holes—or the size of the pool or the number of Tennis Courts or amount of Golf or Tennis played—or the cost of membership and number of members—sure these are all factors—but the real difference—I think—is because peoples needs are different and because of the different needs of members each club you get involved with will be a new experience. It is an excepted fact that Clubs are founded or joined by people who have a common social, ethnic or economic reason to do so. What I'm driving at is the Club may have 100 maybe even as many as 2000 or so members but the over all personality—demand on general appearance of members will be as one. The practicing psychosociological aspiring assistant or Golf Course Superintendent will do his homework, he will discover the facts, that the club doing hiring is X type of club, with Y type of membership, and employs Z type of people. After doing the homework and presenting him or herself as an XYZ type of person he or she will probably get the job. Once employed, the continued use of psychosociology and a good deal of luck will determine the assistant or Golf Superintendents tenure.

Most Clubs (all that I have personally been employed by) have one man directing the actions of the Golf Course Superintendent. He maybe called by many different titles, but he is most commonly referred to in our profession as "Green Chairman".

It is the Green Chairmans basic function to relay the policies of the Club and the wishes of the membership to the Golf Course Superintendent and to carry from the Superintendent his needs and programs to the Board of Governors and members and keep everybody informed and happy.—Sounds simple enough.—Well I maybe unique but I personnaly feel the Green Chairman has the worst job at the Club—middle man—and besides he usually is not paid.

In high school I was told by a little old college prep English teacher to "Know your professor" give the prof's what they want not what you think they want—and I'd get through college. I've never forgotten that piece of advise and I've used it. Not only while attending Stockbridge but also in my dealings with Clubs and especially in my dealings with my Green Chairman.

An honest, up front, frank relationship with your green chairman can be a rewarding experience for both of you. You may be told to do a few things at your club that will rub you the wrong way but if you develop a good rapport with your green chairman believe me they will be few and far between. If on the other hand your relationship with your green chairman is poor, your reward will be the opportunity to practice your psychosociology at some other club—Remember, your the one getting paid and the chairman—well he only has influence with his peers—enough said.

The Golfer at your club will take a tremendous amount of understanding on your part in order for you to be successful in your dealings with them. Golfers are a strange but exciting group—they'll play in rain, wind, snow, ice or on days when you could fry an egg by placing it on the #1 green. On the other hand, deny them the use of their golf course or a golf cart and they go from ladies and gentlemen to an enraged mob. The psychosociologic thinking Superintendent never forgets that his golfers generate the funds necessary to operate the club and pay the salaries. We need the golfer, and we need more golfers,—promote Golf whenever, wherever and however you can. Golfers on the other hand often look at Superintendents as Gestapo Generals—who's only reason for existance is to harrass them about ball marks, divots, foot prints in traps, keeping golf carts off fairways. The successful Golf Course Superintendent takes golfers comments and

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wishes in stride and under advisement—try never to commit yourself to an exact course of action—mother nature or your committee may have other ideas. Most golfers come to their club to escape the pressures and problems of their business and all they want is a jaunt in the country to forget for awhile. A pleasant smile and hello from their Golf Course superintendent maybe the nicest thing that happened to them that day.

Your dealings with other members of the club management staff such as the General manager, Clubhouse manager, Golf Professional, Tennis Professional, engineer, etc. will also require psychosociologic use—Remember, they too are considered experts in their particular fields and have their own problems, pressures and occasional bad days—treat your fellow department heads with respect and understanding, be quick to cooperate and you'll become part of a successful club management team. Bickering between department heads only causes gossip, friction and hard-feelings with-in the Club and most clubs won't put up with it for very long. You may find that in order to be considered—cooperative—you are the one always giving or doing. And that's usually the case—my suggestion is to relax and do as much cooperating as you need to and it will not go unnoticed or unappreciated by the people who are in the know at your club.

The most difficult group for me personally to practice my psychosociology on are my employees. Over the past seventeen golf seasons at five different clubs I have conservatively dealt with from 250 to 350 employees. Some for as little as a few hours—a couple for as long as six years. If you think members or green chairman or even Golf Courses can give you gray hair—just wait until you start your daily diet of employee problems.

Employees or the "crew" as most superintendents refer to them can be your greatest asset or on the other hand they can break your back. Most clubs and some superintendents treat the crew as a necessary evil. The psychosocialogic practicing superintendent sees them as an extension of his eyes, ears and hands, and if the superintendent is open and candid with his staff he might find that some of them have semi or professional skills that will come in handy around the club.

The hiring and firing of employees is an area of my responsibility that I find most difficult—First hiring—a recent article in the Washington Star Newspaper stated that a study conducted on the success of professional interviewers as compared to the success of high school seniors as interviewers showed no significant difference in the quality of personnel chosen. It did show the single quality most used in measuring applicants was appearance and it also concluded that most interviewers didn't know enough about the position being filled to hire effectively. The method of hiring I prefer is to check with the top people on my staff when a vacancy occurs and if they know of someone who they feel will fill the position adequately and after interviewing that person I agree I'll hire that person. I feel this benefits all concerned the employee—the new employee— and myself. It doesn't always work out—bu

feel that it is better than lets say newspaper ads that bring you every Tom, Dick and Harry and can bogg you down for days. Let your instincts guide you and eventually you'll come up with the right combination of employees to be successful. Its a constant hassle but you'll get used to it.

Firing employees is something I personally hate to do and I usually procrastinate the inevitable as long as possible. I know this is a potential weakness of mine and I've worked at improving but "firing" is final and before I rid myself or the Club of an employee I want to be absolutely sure its the employee's fault and not mine that he's leaving. The only hard and fast rule I endorse for firing is "stealing". I'd fire any man I had regardless of his value to the operation for stealing. My policy eliminates the need for stealing and I strongly recommend this policy.

Continued lateness, too many unscheduled absences, lack of interest will lead me to dismissing employees—one thought you should consider is "The devil you have may be better than the devil you get." In most cases when you are newly employed by a club you will inherit the former superintendents staff. This can be a blessing or complete disaster depending on how you practice your psychosociology. You may not be thrilled with your inherited staff, but on the other hand they may be questioning how the hell the club could have hired an idiot like you. Start slowly with new employees and that goes for yours as well as the ones you inherit. Drastic changes or forced feeding of job expectancies can cause serious problems for all concerned—problems that could take weeks or even months to correct. If you and the employee are incompatible you'll both recognize that fact soon enough, and a mutual separation can be worked out so that a great deal of the unpleasantness can be avoided.

Your professional acquaintances take some psychosociologic use to get along with also. Other Golf Course Superintendents, Salesmen and most assuredly Turf Grass Experts such as our own good Doctor Troll will play a tremendous part in your eventual success in this profession. You'll constantly be questioning other superintendents about their methods—Salesmen about their products and Turf Experts about their knowledge of a particular problem or on a new development. If your willing to give as well as take you'll probably come up with the answer—The best answer—the answer you are looking for. The process of give and take is probably as well defined in golf course management as it is in any field of endeavor. The Golf Course Superintendents who practice it best are generally the most successful. The psychosocialogic practicing Superintendent will join his local G.C.S. Chapter as well as the Golf Course Superintendents Association of America and will work with them for the advancement of his profession. He'll also take time to attend the equipment field days and service schools, set up by his suppliers for his benefit and he will attend; and participate when asked, in as many programs provided by state and local colleges, universities, governments on allied associations as he can fit into his busy schedule. Working for and within your profession will only help you grow as a professional and more importantly as a person—Get involved—apathy is a dirty six-letter word. You will also discover that although this is a passive profession their is still some competition—competition between Clubs for members and superintendents for that recognition as maintaining "THE" Quality Turf grass in the area. It will be music to your ears when you hear how great your Golf Course is when compared to those of your peers—But, remember, "EVERY DOG HAS HIS DAY" and it will be more than disappointing when you hear your course being compared with the local dump. Having had the personal experience of hearing both—I can assure you that

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the first is much easier to deal with. The psychosociological practicing superintendent works at the art of humility. He's been through it long enough to know that the worm turns in this profession and that today's hero has the best chance of being tomorrow's goat.

The final group, and one that will put your psychosocialogy to a severe test is "family". I've been married all but six months of my seventeen year career as a Golf Course Superintendent and take it from me—Keeping a wife and raising children while working six or seven days a week will offer you a strong challenge. Little things such as—No Summer Vacations—very few holidays off—Not keeping regular work hours—only occasional meals as a family together—taking and picking up kids from various functions—attending local and natinal professional meetings have all caused some heated debates in the Emerson House and I'm sure we're not unique. The Golf Course Superintendents profession demands a great deal of your time and I can guarantee you, your family will be on your case if you don't include them as part of your Golf Course Management Team. We know we can't take them to work with us, but we can bring our work home to them. Discussing the highs and lows of your day with your family will make them feel their part of your team and when the going gets rough—they'll be there to pick you up—believe me. It took me too many years to include my family as part of my team but since I have I've become a much better Golf Course Superintendent.

Massachusetts Pesticide News

United States Department of Agriculture and County Extension Services cooperating Department of Entomology, Fernald Hall, University of Massachusetts (413) 545-0932

When will you get your certification cards?

About 5,000 people have now completed their certification exams in MASS and are waiting to receive their cards. When will they come?—My guess is Jan. 1979. Here's a checklist of the progress made so far in securing legal authority from EPA to certify applicators in MASS.

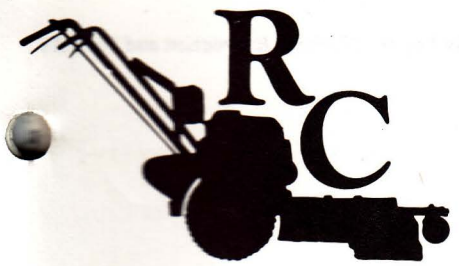
Needed

—a new state pesticide law passed Feb. 1978
—a new Pesticide Board appointed June, 1978
—new pesticide regulations passed by board Sept. 1978
—EPA's approval of our *State Plan* to *Certify Applicators* ?Dec., 1978

Our plan to certify applicators will be submitted by the governor this Sept. to EPA. The public review process in Washington will take about 2 months. So I estimated by early December we could have EPA approval. Cards could then be produced and mailed in late December, but more likely would be held off until after the Christmas rush. So look for your cards in Jan., 1979.

Involved in Mosquito Control? Read this!

If you are an applicator who does mosquito control work, or a municipal official in charge of supervising such work Jere Downing is a new member of the UMASS Entomology Dept. that you should know. He has just been hired by the Extension Service to provide practical help to the mosquito control community. So, if you need advice on the right materials to use, approaches to try, or have unusual problems this is the person to talk to, (call 413-545-2284 or write Dept. of Entomology, Fernald Hall, UMass., Amherst, MA 01003). Among other improvements, next spring look for a mosquito control pesticide recommendation booklet by Jere. This will be the first University recommendation for mosquito control in MASS in many years. Jere comes from N.J. and has 8 years of mosquito control experience. A native of Maine he is oriented toward solving the problem and is ready to be of help. Call him!!



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CROSS-COUNTRY SKIING:
Good winter recreation that pays its own way

By O. A. Christiansen

Establishing and operating a cross-country ski touring facility demands only a modest investment, while providing an exceptional outdoor sport activity. This article offers constructive advice.

When winter blankets the landscape in a mantle of white, many outdoor acres lie deserted until spring. Golf course clubhouses sit boarded up, parking lots drift over, forests stand silent. Many a rise and fall of land lies untracked save for an occasional fox or rabbit, until spring brings the first wildflowers.

Onto such a whitened scene can stride a figure, easily skimming along marked and prepared trails or tracing a new route through freshly fallen snow. The person relaxes, enjoying the solitude of the world around him, shared with two or three companions now topping the rise.

Cross-country skiing is a winter activity that has found new converts in increasing numbers in the last several years. Its unpressured pace attracts even people who ordinarily may not pursue physical activities or sports.

This article can help a community or an agency in considering cross-country skiing as a complement to indoor winter recreation.

Mr. Christiansen is assistant to the superintendent of Hennepin County Park Reserve District, Maple Plain, Minnesota.

With so much emphasis on downhill skiing in the last 25 years, it is easy to overlook the fact that skiing started out as a cross-country affair. Archaeological excavations in Sweden verify that the original skis, believed to have been used in 2000 B.C., were of uneven lengths. Museums display a short pushing-ski, three to four feet long, and the other a long, gliding runner, sometimes as long as ten feet. Later models, used around 1206 A.D., were of even length, with extremely curved-up tips.

With the introduction of lightweight touring skis, boots, and poles in recent years, there has been a tremendous resurgence in cross-country skiing. The activity is easy to learn and can be enjoyed at whatever pace a skier wishes. People are discovering the pleasure of leisurely gliding across the snow in forests, fields, and golf courses. The cross-country skier avoids lift waiting lines, can converse with companions while covering distance, and enjoys a quietude not possible where "Schuss-boomers" come clattering around. Cross-country skiers experience a variety in pace and challenge when climbing a slope offset by the thrill of coasting down the other side. Picnic tables and warming shelters at appropriate distances offer rest from what often turns out to be very warm work, even on cold days. In fact, an average-weight skier will burn 200 to 400 calories in one hour. This may encourage many of our citizens, who are an average of 20 pounds overweight, to try cross-country skiing.

A community or an agency with available area that lends itself to cross-country ski touring or cross-

country ski racing should prepare during the current winter months for next year's season. Experienced cross-country skiers can ski proposed trail locations now and advise on adjustments in trail alignment, obstructions, hazards, and recommend the best routes. If the agency plans on providing rental equipment, equipment purchases are usually made in July preceding the ski season.

Snow

Skiers and area operators depend on natural accumulations of snow; snowmaking for cross-country ski trails is not economical. Snow is lost by melting erosion, and evaporation. As the northern hemisphere passes through its winter cycle, the sun is lower in the horizon and its rays strike the earth's surface at an ever-decreasing angle. On south- and west-facing slopes, however, the sun's rays may still strike the earth at nearly right angles, resulting in melting and evaporation.

Methods of catching and holding snow on trails are two important considerations when planning a trail system. If possible, avoid placing trails on open, unshaded south- or west-facing slopes. Trails that cross slopes may be suitably protected if shaded by trees, shrubs, or nearby hills. Because winds scour snow fields in the same manner as sand dunes, ski trails cut through long grass such as full-grown bromegrass, alfalfa, or other high plants, will help catch and hold the snow in the trailway, serving as a kind of snow fence on each side of the trail; however, wherever snow melting occurs, it is necessary to shovel snow onto the bare spots.

Trail Layout

Cross-country skiing is vigorous and invigorating. Because the large muscles of the arms and legs are involved, the cross-country skier often feels very warm after a few minutes of skiing. One hour's activity may be all a skier can tolerate before resting. Our experience at the Hennepin County Park Reserve District suggests the well-conditioned, advanced skier may travel 10 kilometers (about 6¼ miles), and the intermediate skier about 5 kilometers (3 1/8 miles), while the beginning skier may be content with about 2 kilometers (1¼ miles), in an hour's time. By comparison, cross-country Olympic racers average better than 11 miles per hour.

Most community ski trails are set along prescribed routes that are carefully thought-out in advance. If there is a local cross-country ski touring club in your community, use its members to help plan the trails. They can offer valuable assistance in making trail layout safe, rewarding, and compatible with the park, forest, field, or golf course in which the trails may be placed. If there is no club in your community, the park and recreation department in your area may be instrumental in starting one.

Trails should be laid out in connected loops, giving skiers a choice of distance they wish to cover. A system of cloverleaf configurations—mostly for one-way traffic—allows the intermediate and experienced skier to determine how far he can travel in a given time. The more difficult runs should be marked to challenge advanced skiers and to warn novices.

Ideally, the trail should be about one-third flat, one-third uphill, and one-third downhill to provide interest and variety. Generally, a 15°-angle or less slope is suitable for novices and general use, while short, 40°-angle-maximum slopes challenge advanced skiers. The trail should start out fairly level for about 100 yards. This gives skiers a chance to get accustomed to snow conditions and apply a different wax to skis, if necessary. If the terrain provides a chance to climb, then the

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skier can glide downhill on returning. If the terrain drops away, it means a climb back to the parking lot, sometimes unwelcome after several hours on the trail.

Hills need a runout at the bottom, preferably with no turns or at most, very gentle turns, because the flexible connection between boot and ski gives the skier little control over the ski.

If possible, ski trails should avoid crossing roads, not only because of the potential accident hazard, but also because the road surface can damage the skis. Gravel, asphalt, and concrete are all very hard on the running surface of skis. Golf courses, often split by roads or railroads, generally overcome this with pedestrian bridges, easily negotiated by skiers if ramp approaches are used. A rest stop with tables at the midpoint of the longest loop invites winter picnicking. A wood-fired barrel stove in a primitive windbreak offers a pleasant rest stop.

Ski rental facilities often pay for themselves within the first two seasons of operation, especially if equipment use is limited to a four-hour rental period, so equipment can turn in revenue twice a day. Ski lessons also may be programmed.

Since most skiers arrive at the trail head by automobile, a parking lot cleared of snow can serve as a staging area for groups of skiers. A nearby, heated building, such as a golf course clubhouse where refreshments are sold, is a nice feature but not required. Simple maps distributed at the starting point of the trails indicate distance, direction, and geographical features for the skier. Heated rest rooms with flushing facilities are also preferable, but it is possible to do very nicely with temporary, self-contained comfort stations or properly maintained privies.

Trail Dimensions

The trail should be at least five to six feet wide, where possible, to permit skiing side by side, as well as snow grooming by machine. Because snow buildup elevates the skier and the grooming machines, trees along level portions should be trimmed up to at least 10 feet in height to provide clearance.

Rough clearing includes brush, stumps, and rocks to permit easy mowing. An 80-inch tractor-mounted rotary mower cuts a generous swath for a double track. Rototilling with a tractor-mounted rototiller, then compacting the trail, may be especially desirable where

Five Steps to Trail Establishment

1. **Area Selection**—Obtain clearance from owners or managers.
2. **Tabletop Planning**—Use existing trail maps and U.S. Geological Survey topographic maps to locate roads, parking areas, terrain, shelter locations, and sanitation facilities.
3. **On-site Planning**—Walk (or ski) routes planned on the map to check: slopes steepness, sun and wind exposure, drainage, and hazards. Adjust plan to fit conditions, temporarily marking trail with strips of orange surveyor's tape tied to trees, shrubs, or grass.
4. **Organization and Budgeting**—Consider cost of trail clearing and construction of facilities. Set timetable for clearing, constructing, and placing signs.
5. **Trail Construction**—
   a. Clearing: remaining shrubs, tree limbs, rocks, etc.
   b. Construction: bridges, rest areas, shelters, sanitation facilities.
   c. Placing Signs: a trail head, on trail markers, construction signs, etc.

Source: Knopp & Mahoney, Ski Touring Trail Planner, *North Star Ski Touring Club, and the U.S. Ski Association, Central Division, Minneapolis, MN.*

the trail serves as a hiking or horseback trail during other times of the year.

Traffic should be routed *one-way* and the trail marked with directional signs. This avoids confusion and potential collisions when skiers meet coming around a curve or on a hill. The one-way traffic should be reinforced by map legends on handouts. Spur trails to spectacular views or special features should be provided.

Trail Signs

To aid ski trail management, use signs at entrances, trail heads, and junctions, or for trail marker or information. Generally, signs with dark back grounds and white lettering, often produced by a silk screen process, show up best against the snow. Entrance signs direct skiers off main roads to the trail head.

Trail head signs depicting the entire trail system, should be placed at the start of the trail, or near the parking lot and staging area. This helps the skier become familiar with locations of rest stops, sanitary facilities warming shelters, and the degree of difficulty of the routes. A code to explain trail difficulty ratings should be on this sign.

Bamboo poles placed in the ground before frost sets in are commonly used for trail markers. Tape wrapped around the top of the pole—one color for each trail loop—assures skiers they are on the trail of their choice. If several trails follow the same route before branching off, then several corresponding colors of tape would mark the same pole. Placing the poles consistently on one side of the trail can confirm that a skier is going in the proper direction.

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Direction signs at junctions help keep the skier on the chosen trail, especially when color-coded or otherwise marked to indicate trail difficulty. Such signs help keep the novice off a trail beyond his or her ability. Signs can also state the distance back to the trail head.

General information signs may caution the skier about a steep hill, upcoming bridge, direction of travel, or a bypass around a difficult section.

Snow Grooming

Snow is a plastic and crushable substance, subject to drifting, scouring, icing, and melting. Fresh, unpacked snow is a blanket of air spaces, and temperature measurements an inch or two above ground usually read near 32° F. Any time snow is compressed, as when a ski creates a track, simultaneous melting occurs. The new configuration, exposed to below-freezing temperatures, recrystallizes to form the rut or groove in which subsequent skiers may follow.

Good area management requires that the trail be set by a track-setting device. This may be done in one of several ways:

1. After each snowfall, one or more cross-country skiers may set the track by "breaking trail" or by skiing each of the trail routes. This should be done as early as possible after the snow stops falling, before colder temperatures set up or harden the snow. The economical "track setters" are volunteer ski tourers.

2. A second method of compaction is to pull a track-setting sled with a snowmobile of 40 hp or more. The snowmobile compacts the snow with its tread. The track-setting sled first rakes the snow toward the center, then spreads it out to the sides, and subsequently sets the track with two pram-shaped wood blocks. Most snowmobiles have all they can handle setting a track for one pair of skis in one pass.

3. A more efficient track-setting sled has two sets of blocks, making a double set of tracks. Because this sled is so heavy, a regular snow tractor of 80 hp or more is required to pull it. Such a tractor is also often used for grooming snowmobile trails and ski areas.

Inspect the trail to determine how often to groom.

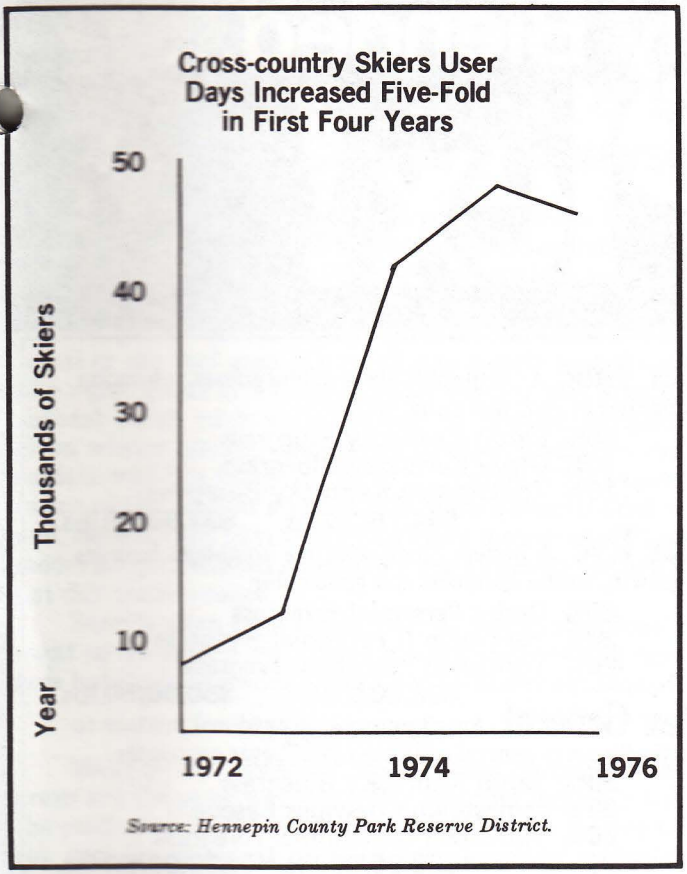
Restrictions

Skiers will follow a well-planned, maintained, and marked trail because it lets them enjoy the outdoor scene and promotes their sense of security.

The cross-country skier finds a well-groomed track an immense advantage in maintaining directional control and effortless gliding. Breaking through fresh snow of more than six inches in depth can be arduous work and, unless skiers take turns breaking trail, a short distance can soon wear out all but the fittest skiers.

Any activity that disrupts this track detracts from an enjoyable experience. Other winter uses—snowshoeing, snowmobiling, tobogganing, or sledding—compact the snow, crush the groove to an icy sheet, and reduce control and safety for the skier. Dogs must also not be permitted because they tend to break up the track while bounding back and forth across the trail. Golf course greens should be fenced to exclude skiers because compacted snow increases problems of snow mold and frost depths. The trails on the fairways and in the rough seem to have very little adverse effect on blue grass or other coarser grasses.

Tractor-drawn grooming sled packs snow and sets track for two cross-country skiers in one pass.



Costs

In 1971, the Hennepin County Park Reserve District established ski touring trails in four park reserves. Attendance is estimated at 7,000 user days in the winter of 1972, increasing to 10,000 in 1973, leveling off at about 50,000 user days in the winter of 1975 with trails in six park reserves. The park reserve closest to Minneapolis paid for the capital investment of 150 sets of rental equipment in the first year of operation. Park reserves farther away from the city paid this cost back within two years.

If you have an area of 100 to 200 acres and want to encourage people to get out and enjoy the crisp, sparkling days of winter, try cross-country skiing. A well-planned route, plus well-maintained trails, plus a warming shelter and rest stops, equal winter fun. If there is snow, skiers will go! Or, as the Swedish say, "langlaufer leben langer—cross-country skiers live longer."

REFERENCES

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Estimated Operating Costs for a Cross-country Ski Trail: 1976

Clearing and mowing ($88.75/mile)	$ 887.50
Trail head sign	125.00
Informational and directional signs ($15.00/mile)	150.00
Grooming (3 heavy snows) ($6.25/mile)	62.50
Auxiliary facilities (barrel stoves, etc.)	250.00
Sanitary facilities (rental)	250.00
Snowplowing parking lots (3 heavy snows)	150.00
Brochures, maps	125.00
Total	$2,000.00

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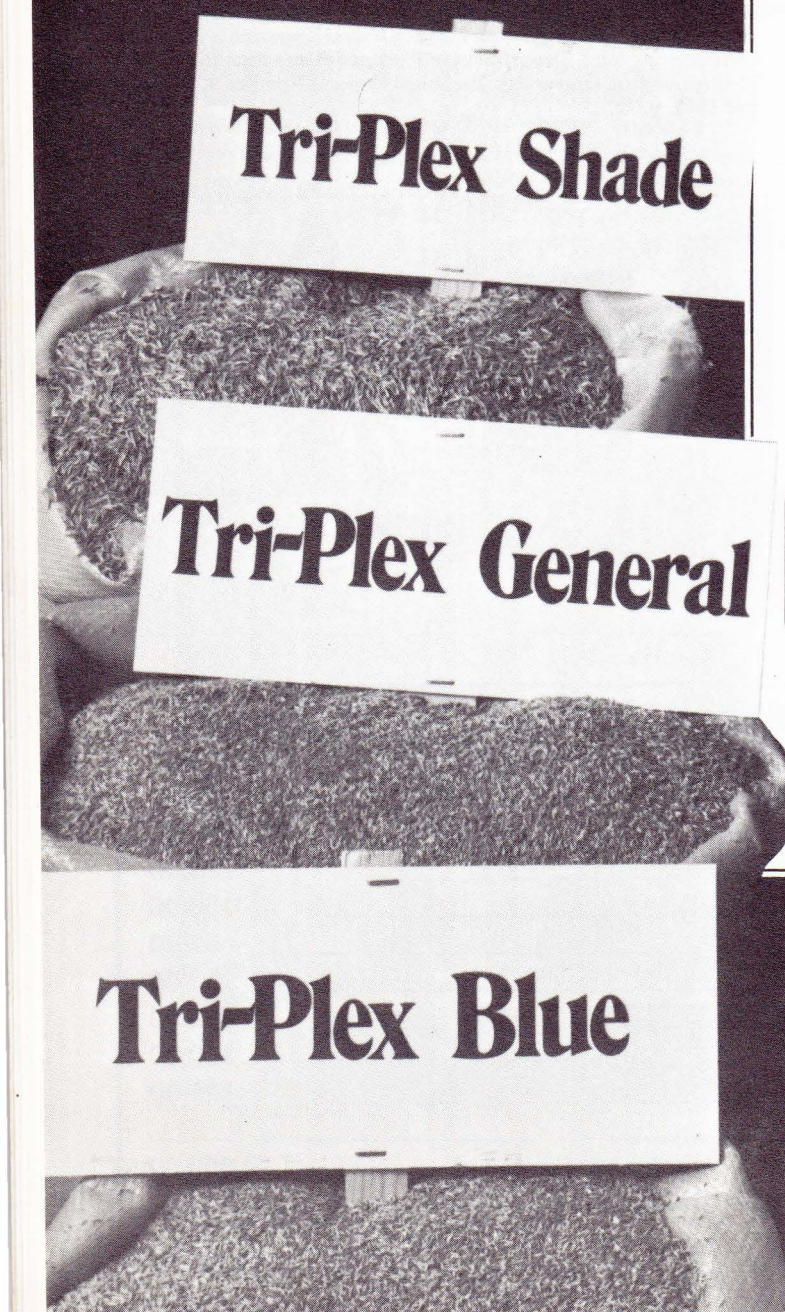

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Sacrification of Large Scale Areas, e.g. Golf Course Fairways, Winter Games Areas, Etc.

Mechanical treatment of large scale areas of turf is a subject that has received increased attention in recent years and no doubt there are several reasons for this. Primarily, of course, the player now expects the highest quality turf and playing surface irrespective of whether the turf area is a small size closely mown one like a golf green or a large slightly coarser turf area of several acres such as a fairway or cricket outfield. Even winter pitches sometimes develop a soft fibrous surface which is improved by scarification. This expectation of the highest standards is quite understandable and, indeed, fully justified when more money as well as modern sophisticated machinery are available for present day maintenance.

Scarification only forms part of mechanical treatment so necessary for a good quality turf playing surface but its importance should not be under-estimated.

Why it is done

Many of the needs for scarification on large scale areas are the same as for smaller fine turf facilities viz. the pulling up of procumbent growth for the mower to cut and the removal of dead and decaying material from the base of the sward. The latter point is particularly important because often large scale areas are gang mown and the clippings returned to the surface where they may accumulate with detrimental effect if there is inadequate bacterial breakdown.

The passage of time can also create over-acid conditions which may encourage fibre build up—this situation is not uncommon on very old golf course fairways which have received little other treatment over the years other than mowing. Liming may be needed in such situations but over-acidity is not the only cause of fibre build up and the only practicable way of reducing excess fibre is scarification.

Type of equipment

Because of the size of the area involved large scale scarification equipment is either tractor-drawn or tractor operated.

The grassland chain harrow is probably the most commonly used tool for scarification of large areas—indeed, until quite recently, with the exception of large sized rakes fitted behind the tractor it was about the only type of scarification equipment available. Grassland harrows come in many forms but probably the best for large turf areas is the tractor-drawn short-toothed flexible chain harrow of say 3 m x 2½ m (9 ft. x 7 ft.) dimensions. A harrow of this nature makes quite a good job of lifting up flat growth and removing dead material from the base of the sward without causing too much damage to the playing surface. On certain types of turf where only a very light form of scarifying is needed a homemade harrow manufactured perhaps from birch or hawthorn branches can be quite effective. Other ingenious types of "harrow" seen from time to time include lengths of old telegraph poles wrapped around with barbed wire!

The rakes referred to earlier are usually some 6-8 ft. (183 cm-244 cm) wide, of straight and rigid assembly and fit behind the tractor. Such rakes are useful for scarifying rather smaller coarse turf areas but they are probably not quite the tool for very large areas.

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Scarification equipment employing the principle of a rotating reel fitted with knives has been introduced in the last few years—the knife bladed reel being driven by land wheels (like a gang mower) or through linkage to the tractor PTO. These large rotary scarifiers seem to be quite effective and efficient and also have the added advantage of providing light or severe scarification by adjusting the depth of penetration of the knife reels.

Timing

Scarification should only be carried out when there is plenty of growth about, i.e. the operation must be confined to the growing season.

Presumably because there is so much other work to do in the growing season most large scale turf areas are probably scarified only once a year—many groundsmen and greenkeepers find that spring time is the best and most convenient time for the work. There is no reason, however, why scarification could not be carried out more than once a year if the criterion of plenty of growth is observed but the work should not be done in very dry weather.

As on smaller fine turf areas it is important to follow up the scarifying work with mowing so as to cut off the straggly growth brought up. On some hockey and football pitches a large cylinder mower can be employed and the scarification debris boxed off but the disposal or dispersal of the debris can sometimes be a headache on areas that are gang mown. In most instances the debris is left to disperse by natural means (a few good gusts of wind will probably do the job) but if the amounts of debris are considerable it is often worth while using a large leaf collector of either the revolving brush principle or the vacuum type to clean up the surface.

Other uses of scarification equipment

Besides being used for scarification work scarification equipment often has a wide range of other uses. Chain harrows and large rakes are often used for producing a suitable soil tilth in the preparation of a seedbed when renovating winter pitches. Both tools, but especially the chain harrow, can be used for helping to smooth out a bumpy playing surface—possibly the smooth side of the chain harrows would be best in some instances. Certainly the smooth side of the chain harrow is often employed to work in soil or sand top dressings on football pitches etc.

Care of equipment

Like all other pieces of maintenance equipment thorough cleaning after use helps preserve and prolong the working life. Chain harrows and large rakes should be occasionally inspected for wear and the appropriate tines or teeth strengthened, repaired or replaced as necessary. With regard to the newer types of rotary scarifiers the manufacturer's instructions for lubrication and servicing etc. should be closely followed.

Finally all large scale scarification equipment should be kept under cover—even a set of chain harrows can deteriorate significantly if kept out in the open.

Plant Materials For Outlying Areas

By Professor John M. Zak
University of Massachusetts

I do not wish to imply or have you assume that I am a landscape architect or horticulturist. However, I would like to pass on to you information that I have acquired from our Massachusetts Department of Public Works and Federal Highway Administration program of research and hope that you will benefit from what we have found.

Under this roadside research grant we have been testing various grasses, legumes, forbs, shrubs, and trees for erosion control, highway beautification, and reduction of maintenance costs. If a plant species is to be used under our Massachusetts climatic condition, it must be hardy, easily established, and able to conserve soil and water.

As a result of experimentation in the greenhouse and in the eight highway districts of the State, we have compiled a list of plant species and methods of seeding or planting to assure good vegetative cover and erosion control.

Most of the areas we have worked on are fill and cut slopes or problem areas where grass and other vegetative species are difficult to establish. The problems exist because we are not replacing top soil; we are, instead, trying to grow plants on acidic subsoil and parent material which have very low fertility. Many of the sites are exposed to high summer temperatures because they face to the south and the soils have low moisture capacity.

We are very much pleased with our experimental results which indicate that it is possible to grow in this area legumes like crownvetch *(Coronilla varia)*, cicer milkvetch *(Astragalus cicer)*, sweet pea (Lathyrus lat), and flat pea *(Lathyrus sylvestris)*. Once established, they should require no maintenance through the years.

We are also using leguminous shrubs successfully. These are 'Arnot' bristly locust *(Robinia fertilis)*, mountain indigo *(Amorpha glabra)*, indigo bush *(Amorpha fruticosa)*, dyer's greenweed (Genista tinctoria), and *Cytissus* species (Scotch broom and others) for the Cape Cod area. Black locust *(Robinia pseudoacacia)* can be used on dry sites and also false indigo *(Baptisia* spp.), a leguminous forb.

We are investigating plant species that fix nitrogen, but do not belong to the legume family. A small but significant number of non-legume species can also develop nodules and the bacteria existing in them can fix nitrogen from the atmosphere. Most of these species of plants are found in areas with very little soil nitrogen content. Very little investigation has been carried out with these plants and little information is available on the fixation of nitrogen, nodulation, and kinds of organisms present in the nodules. However, it is believed that some of these plant species can fix the same amount of nitrogen as legume plants. Since they are nitrogen fixers, they are useful on soils of low fertility and poor environmental growth sites.

The following nodulated non-legume species are being successfully used for stabilizing slopes:

Autumn olive	*Elaeagnus umbellata*
Bayberry	*Myrica pensylvanica*
Bearberry	*Arctostaphylos uva-ursi*
Buckthorn	*Rhamnaceae*
Russian olive	*Elaeagnus hortensis*
Sweet fern	*Comptonia peregrina*

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Other valuable shrubs in use are: red osier dogwood *(Cornus stolonifera)*, tatarian honeysuckle *(Lonicera tatarica)*, dwarfbush honeysuckle *(Diervilla lonicera)*, Nanking cherry *(Prunus tomentosa)*, sweet pepperbush *(Clethra alnifolia)*, and sumac species.

There are other plants that fit into our landscape pattern which can be planted successfully. However, the ones that I have mentioned are ones that I have worked with in my research program.

Most of my work has been done on 2-1 slopes. This means that a gradient of one vertical foot to each two horizontal feet produces a steep slope, difficult to work and maintain. A 3-1 slope is gentler, easier to work, can be mowed if seeded to grass, and lends itself better to landscaping. Erosion control is less of a problem, also.

If grass is to be grown on slopes, there will be fewer maintenance problems if the area is loamed, limed and fertilized to produce good healthy turf.

If one does not wish to grow grass because of mowing problems, it would be possible to seed directly crownvetch, cicer milkvetch, or flat pea. Once established, it should not require maintenance. Crownvetch does very well where there is moderate soil moisture; cicer does well in wetter areas, and flat pea can be seeded on dry sites. Cicer milkvetch and flat pea will also do well in well-drained soils of good moisture capacity.

If shrubs are desired, it would be best to plant them (or root cuttings of sweet fern, sumac species, bristly locust) in an area covered with 3-4 inches of wood chip mulch. These mulches are excellent on slopes for control of erosion. Shrubs can be planted into these mulched areas at any convenient time. Slow-release fertilizer may be applied at the time of planting or may be delayed until the second year.

Biological Control of Crop Diseases

Attempts to develop non-chemical controls for pests have been hindered by the unsuitability of most biological control agents to being packaged and sold. For example, insect parasites are unsuitable for sale because they are difficult to mass produce, have little or no "shelf life," are slow acting and difficult to apply correctly. This has limited the use of these beneficial insects to either government projects paid for publicly or in a few instances grower cooperatives that maintain private insectaries — as for example California citrus growers.

The use of disease producing agents such as bacteria and viruses differs from the use of parasitic insects since these microbes are more easily packaged, stored and marketed (like a chemical pesticide) once the technical problems have been worked out. Products like Dipel or Thuricide using *Bacillus thuringiensis* are an example.

In a similar way it may soon be that products containing various soil bacteria will be available and sold commercially to either stimulate crop growth directly or reduce plant diseases by opposing disease causing organisms in the soil. If so, biological control of plant diseases may shift ahead of biological insect control. Milton Schroth, plant pathologist of U. Cal./Berkeley is involved in work of this sort.

A book in this area that looks good is Biological Control of Plant Pathogens by Baker and Cook (1974) published by Freeman & Co. in San Francisco.

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