Northwest TURFGRASS TOPICS

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PRESIDENT'S MESSAGE

Gary Sayre

As a proud member of the Northwest Turfgrass Association, it is my distinct pleasure to serve as your president for the year ahead. We have an organization that is one of the very best in the turfgrass industry. Since its founding in 1948 the NTA has strived to carry on more and better research and encourage the growth and interest associated with the turfgrass industry.

This year our Research and Scholarship Committee is being chaired by Mike Nauroth. This Committee is responsible for reporting their recommendations to the Board of Directors regarding scholarship grants and the sponsorship of research projects which are carried on at the local universities and experiment stations.

Gene Howe (our treasurer) and Dennis Pagni are heading up the Membership Committee. We are always interested and open to new members joining our ranks from the turfgrass industry. This year we have included the registration fee for attendance at the conference in the dues structure, so your dues in July 1985 will be $75. If you have any friends who are in the turfgrass industry or a related business, please ask Gene, Dennis or any other member of the Board of Directors for application forms so we can enlist them in our Association.

The Chairman of our Trade Show and Program Advertising is Mark Snyder (our vice-president). He will be responsible for setting up the suppliers evening for the Conference this year and also selling advertisements for the program (which are tax deductible). If you would like to have booth space and/or an ad in the program, be sure to contact Mark.

Our Educational Chairman is Tom Cook and, believe you me, he already has enough topics to cover two conferences. Tom is well on his way to putting together a great group of educational sessions for the Rippling River Resort Conference in September 1985. If you have input that could help to improve our Turfgrass Association, be sure to contact myself or another member of the Board of Directors.

I extend to all of you my best wishes for the very best of Christmases and the happiest of New Years from the Board of Directors of the Northwest Turfgrass Association.

NORTHWEST TURFGRASS CONFERENCE - 1985

The membership of the Northwest Turfgrass Association must be congratulated on their nomination and election of a really great bunch of directors. You wouldn't believe how fast they have gotten off the ground and have things moving to provide as near a flawless and super conference as can be produced for Rippling River on September 23-26, 1985.

Tom Cook, from Oregon State University, is chairing the Program Committee and is assisted by Roy Goss and others, and we guarantee you a broad spectrum and fulfilling educational program.

Mark Snyder and his group practically have all of the details worked out for the Exhibitor's Session and is actively seeking the remainder of the exhibitors to fill the booth space and to obtain their advertising for the program brochure at this time. If they can get all of the booth space sold and the ads in by early spring, there will be an early printing of the program with all of the advertising, and should be in your hands no later than June 1985.

All of the other committees are hard at work on their tasks and your capable president, Gary Sayre, is leading them on with a great deal of encouragement.

Rippling River Resort is just east of Portland, Oregon, near Mount Hood and is easy to get to by any of the north-south freeways and then go east toward Mount Hood. The facilities are very good at Rippling River, which includes good rooms, pools, excellent meeting rooms, adequate display area, 27-hole golf course, tennis and many other recreational facilities. Bob Senseman, golf superintendent, promises beautiful weather while we are there and we will hold Bob to this.

Block out this time right now and start getting all of your approvals for attendance at this Conference and I am sure you will agree, it is the best we have ever staged.

1984 CONFERENCE RECAP

The 1984 Northwest Turfgrass Conference is history and all papers submitted for the Proceedings are presently at the printers and should be off the press and in your hands by early January. The Proceedings this year will be nearly 200 pages in length and covering nearly every presentation made at the Conference.

The Spokane Sheraton Hotel proved to be an excellent site for our Conference and the cooperation by their convention and catering representatives helped make things run smoothly.

The weatherman cooperated perfectly so that everyone enjoyed crisp nights and warm, sunny days helping to make the golf tournament a whopping success and a pleasure for other people in off hours.

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SPECIAL RESEARCH FUND CONTRIBUTORS - 1984

The Officers and Directors of the Northwest Turfgrass Association extend a sincere thanks to all who contributed to the Special Research Fund in 1984. In the past year your funds were used for the following purposes:

1. Support of a research associate in Agronomy since September 1983.
2. Turfgrass student scholarships to Oregon State University and Washington State University.
3. Research grants for partial research support at the Western Washington Research and Extension Center at Puyallup and turfgrass research programs at Pullman, Washington.

It is the responsibility of each of us to help provide financial means for insuring the future of the turfgrass industry. Those of you who contributed to these programs in 1984 can feel proud of your support in these endeavors.

Alderbrook Golf and Yacht Club
Astoria Golf and Country Club
City of Bellevue - Park Department
Black Butte Ranch
Blue Lakes Country Club
Broadmoor Golf Club
Capilano Golf and Country Club
Chelan City Golf Club
Columbia-Edgewater Country Club
Cumberland Valley Turf Farm
Elite Lawn and Turf
Emerald Turfgrass Farms
Eugene Country Club
Everett Golf and Country Club
Fairwood Golf and Country Club
Glendale Country Club
Gold Mountain Golf Course
Green Meadows Country Club
Hayden Lake Golf Club
Hi-Cedars Golf Club
Don Hogan
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Kah-Nee-Tah Resort
Kitsap Golf and Country Club
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Lakeside School
Leavenworth Golf Club
Linden Golf Club
Longview Country Club
Manito Golf and Country Club
Meridian Valley Country Club
Al Mundle
Nile Country Club
Northshore Golf Club
Northwest Golf Course Superintendent's Association
Oakbrook Golf Club
Oregon Turf Farms
Oswego Lake Country Club
Overlake Golf Club
PGA - Pro Ams
Pleasant Valley Golf Club
Port Ludlow Golf Club
Portland Golf Club
Pro-Grass
Puget Sound Seed Company, Inc.
Rainier Golf Club
Red-E-Turf, Inc.
Riviera Country Club
Royal Oaks Country Club
Sahalee Golf Club
Salishan Golf Links
San Juan Golf and Country Club
Seattle Golf Course
Sham-Na-Pum
Shaughnessy Golf and Country Club
Shelton-Bayshore Golf Club
Similk Beach Golf Course
Spokane Country Club
Spokane Parks and Recreation Department
Sun River Properties
The Properties, Inc.
Tacoma Country and Golf Club
Twin Lakes Golf and Country Club
Ken Tyson-Madrona Links Golf Course
Vashon Golf Club
Wandermere Golf Club
Washington State University
Washington Tree Service
Waverley Country Club
Willamette Valley Country Club
Wing Point Golf and Country Club
Wolfkill Feed and Fertilizer Corporation
Charles W. Woosley
Yakima Country Club

We apologize to any contributor that we may have overlooked and would appreciate you letting us know. We would also like to especially thank Northwest Mowers, Northwest Equipment Distributors, Inc., the Northwest PGA, and Gary Senno for significant contributions to research programs.

NEW DIRECTOR

Gene Howe is the owner of both Sportsturf Northwest and Sammamish Turf Farm in Redmond, Washington. Through a variety of education and turfgrass-related employment since 1967, Gene has enjoyed a variety of exposures in the turfgrass industry. Beginning as a golf course groundskeeper at Tam O'Shanter Golf Club and Inglewood Golf and Country Club, he moved north to help in the construction and maintenance of the Sudden Valley Golf Club. He then became an assistant superintendent at Port Ludlow Golf and Country Club during its construction. His education at Washington State University and the University of Washington earned him a BA degree in geography/earth sciences and opened the way to join the City of Bothel as their initial park superintendent, a position that, for 6 years, allowed him to manage budgets, personnel, work with boards and councils, and put his turfgrass knowledge to work to build or rebuild six of the city's seven parks. At the same time Sammamish Turf Farm was started to grow and market lawn sod to the homeowner.

Three years ago Gene left Bothell and purchased Sportsturf Northwest from Jim Chapman to combine both turf businesses. STNW provides turf management services to school districts, park departments, and others who do not have the proper equipment or personnel necessary to make the fields safe and playable.

Because of the many experiences with Sportsturf Northwest, Gene feels strongly that turf education of grounds managers, users, and budget administrators is a top priority. He is hoping that his election to the Board of Directors of the Northwest Turfgrass Association (and subsequent election as treasurer and membership chairman) will help broaden the membership base and expand the horizons of its members through their NTA participation. Gene can be reached at 10510 - 158th Ave. NE, Redmond, WA 98052 or (206) 883-8873.

NEW NTA DIRECTOR

Tom Cook, Associate Professor of Horticulture at Oregon State University, was elected to the Board of Directors at the membership meeting at the September Turfgrass Conference in Spokane. Tom was born and reared in Okanogan, Washington, and received his B.S. in Agronomy at Washington State University. He went on to complete his Masters in Agronomy at the University of Rhode Island. While working on his Masters degree he worked on golf courses and achieved a good background in golf course management operations.

Upon completing his Masters degree, Tom accepted the position as Research Associate at the Western Washington Research and Extension Center and worked closely with Roy Goss on turfgrass research programs from 1975 to 1978. Tom accepted the position of teaching Turfgrass and Landscape Management at Oregon State University where he is presently employed. Tom has developed a strong teaching program in both of these areas and has developed some very good students who are in the field today in various areas of turfgrass management and landscape management.

Tom was not unfamiliar with the operations of the Northwest Turfgrass Association and was immediately named chairman of the Program Committee and promises to come up with a super educational program for 1985 at Rippling River. We heartily welcome you aboard, Tom.

Con't from page 1, col. 1
Conference Recap

The educational program was extremely well attended and, according to questionnaires to the audience, it was rated good to excellent. The questionnaires also revealed a few other good suggestions from Conference attendees that your board of directors are taking a hard look at this time to try to fulfill your requests in as much as possible.

The Special Trade Show, although it was conducted for only one evening's duration, was rated as a good success and was extremely well attended, and everyone seemed to have a good time and learned something from the distributors and exhibitors during that evening.

We would again like to thank all of the speakers who came from long distances to help make the educational program a great learning experience and especially you, the attendees, who took your time and expense to be there and take something new home. Turfgrass student presentations were very well done and received many favorable comments.

We look forward to seeing you next year at Rippling River with an even better Conference.

SAM ZOOK RETIRES AFTER A LONG CAREER

Sam literally cut his teeth on a golf course where he started shagging golf balls at the Clark County Golf Course in Vancouver, Washington, in the early 1930's. His second job was at the Peninsula Golf Club in Portland, Oregon, after which he started working full time at the Columbia Edgewater Golf Club in 1937.

Sam's golf superintendent career was interrupted with World War II where he served in the Navy during that time.

Following the War, Sam took over as superintendent at Pendleton Golf and Country Club in 1946 and stayed there for six years until 1952 when he took over the superintendent's job at Eugene Golf and Country Club.

Sam was a superintendent at Eugene during 1952 and 1953 after which he became the superintendent at the prestigious Waverly Golf and Country Club through 1968. He replaced Milt Bauman as golf course superintendent at the Overlake Golf and Country Club and remained there until his retirement in 1984.

Sam's participation in the Northwest Turfgrass Association goes back a long way. His name appears among the very earliest participants in the Conference and directors of the Association, dating back to 1948-1950. Sam rarely missed a conference and served in various capacities on the Board of Directors and was president of the Association in 1954.

Sam has been blessed with a terrific wife, Jerry, who has taken a keen interest in his work and is an avid golfer herself. With Jerry's friendly and outgoing personality, she was a tremendous aid to the Ladies Program in helping to make newcomers feel welcome and a part of the organization.

Sam has survived the stresses of the golf course superintendent including heart surgery and looks none-the-worse-for-the-wear after more than 40 years. He is highly respected by his peers and always had the time to help others when they needed. He is truly a Class A Superintendent.

The Directors and Officers of the Northwest Turfgrass Association wish you and Jerry a long and happy retired life at your new home in Woodburn, Oregon.

DICK MALPASS RETIRES

After 22 years as a golf course superintendent who achieved considerable distinction in his career, Dick Malpass retired officially as golf course superintendent in September 1984.

Dick helped to build Shadow Hills Golf Course at Junction City, Oregon, and became its first superintendent in 1962, staying on as superintendent until 1970 when he and his wife, Frances, moved to Vancouver, Washington, and took over the superintendent position at Riverside Golf and Country Club in Portland, Oregon. Prior to Dick's becoming a golf superintendent, he worked many years with the Oregon State Department of Agriculture in a number of supervisory positions.

Dick has always approached his work as a Class A Golf Superintendent with a great deal of enthusiasm and a keen drive for learning and implementing new techniques and providing the best facilities for his membership within budgetary means. Dick is one of these people who always took advantage of educational opportunities and profitted by them. He was active for many years with the Northwest Turfgrass Association, serving both as a director and two times as president - 1966-67 and 1982-83.

Dick Malpass, after serving several years as a Director of the National Association (Golf Course Superintendents Association of America), was elected the 40th president of this large Association in February 1976 and served as the President until February 1977. Dick has been well supported in his career and activities by his devoted wife, Frances, and now they are both enjoying their retirement at their home, 10804 NW 11th Avenue, Vancouver, WA 98685. They are both strong enthusiasts in lily breeding, selection and propagation and now will have more time to devote to these activities. We hope to see both of you at our functions from time to time and wish you the very best in retirement.

FORREST GOODLING RANDY KING

FORREST GOODLING (left), a senior in turf management at Oregon State University recently received a $500.00 TUCO turf scholarship. Goodling is the son of Jopell and Elizabeth Goodling of 3816 NE 102, Portland, Oregon. The award was presented by TUCO representative, Randy King (right). TUCO is a division of the Upjohn Company. The scholarship was awarded for academic achievement, career interest and personal attributes.

GCSAA SCHOLARSHIP

Forrest Goodling was also recently awarded a scholarship sponsored by the Golf Course Superintendents Association of America. Forrest has an extensive background in golf course maintenance, having worked for his father at Broadmoor in Portland, Salishan on the Oregon Coast, and last summer at Seattle Golf Club. He plans to pursue a course in golf course management upon graduation from OSU.

INTERNATIONAL GOLF COURSE CONFERENCE AND SHOW

The 56th International Golf Course Conference and Show will include something for everyone through the many educational seminars, awards, spouse programs, golf, tours, election of officers, research, international golf news, golf course design, golf course management, the latest golf equipment and supplies, entertainment and famous sports personalities. This international golfing event is sponsored by the Golf Course Superintendents Association of America (GCSAA) February 5-13, 1985, at the Washington, D.C. Convention Center.

This international conference and show is the largest of its kind in the world, and it truly is an international event. The International Golf Course Management session features Rolf Lowgren, Consultant, Swedish Golf Federation, Stockholm, Sweden; Jimmy Kidd, Gleneagles Hotel and Golf Course, Perthshire, Scotland; Donald Harradine, President, British Association of Golf Course Architects and President, International Greenkeepers Association; and Stephen Miller, President, Canadian Golf Course Superintendents Association, Burlington, Ontario.

The Opening Session of the Conference will feature Jack Whitaker, ABC-TV sports announcer, as well as the presentation of the Distinguished Service Award, the Leo Feser Award and Chapter Newsletter Awards to GCSAA members.

Other special sessions will feature the USGA Green Section program with a special presentation by professional golfer Ben Crenshaw; an architect session bringing attendees the latest word in golf course design; a prayer breakfast featuring broadcast journalist Cal Thomas; the Association's Annual Meeting with election of 1985 officers; and the annual Banquet and Show featuring country-western singer Tanya Tucker. Also, during the banquet, GCSAA's own Old Tom Morris Award will be presented to Gerald R. Ford, former President of the United States. Arnold Palmer and Bob Hope, previous recipients of the award, are also expected to attend.

In addition to the special sessions, the conference will bring 336 hours of educational sessions aimed at the most important person in golf course management—the professional golf course superintendent. More than 100 researchers, businessmen, professional superintendents, scientists, and educators will present the latest in turfgrass research and management techniques to the attendees, who are expected to push the 10,000 mark.

The Trade Show, which is undoubtedly the industry's largest under one roof, will feature the latest golf course maintenance equipment and supplies and offers attendees 19 hours of viewing during the three days of the Show.

"Registration is running ahead of last year's record-setting pace for the 1984 Las Vegas Conference. This international conference continues to grow, and we expect the final registration to establish another record for GCSAA," said John M. Schilling, GCSAA's Executive Director.

For registration and further information, call 1-800-GSA-SUPT.

RECENT RESEARCH IN SAND, SOIL, AND PEAT MIXTURES

Summarized by Russ Vandehey
Turf Student, Oregon State University

A sand, soil, peat mixture could be the ideal medium in constructing your new green or athletic field. Since 1979, four papers have been written by Blake and Taylor dealing with this subject. Their research ranged from analysis of each component to establishing the proper mixture content. The findings of these papers are discussed below.

Providing a growing medium for turf which resists compaction but also has necessary properties for plant growth has been a major problem for managers of turf. Sand-organic mediums have proven to be effective in reducing the compaction problems that occur on heavily used playing surfaces, but are often inadequate in water and nutrient retention properties and therefore difficult to grow healthy turf on. It appears that the organic matter component in most sand-organic mixtures does not supply adequate CEC properties. This is the point at which the research of Blake and Taylor needs to be seriously considered. Blake and Taylor have done extensive studies using sand, soil, peat mixtures to find the ideal medium for high traffic areas. Their addition of soil is the key to regaining adequate nutrient retention in high sand mediums.

Their research was set up to find the ideal ratio of sand, soil, and peat which would provide the chemical properties of soil and still have the desirable physical characteristics of sand. The texture of these mixtures must be coarse enough to permit rapid air and water movement under compacted conditions, yet have sufficient nutrient and water holding capacity to allow for growth of healthy turfgrass.

The results of their analysis indicate that ratio of mixing volumes and texture of the soil component are the critical factors in determining the sand content of sand, soil, peat mixtures. Also important is an accurate particle size analysis of the soil component including particle size distribution of the sand fraction of the soil. Texture can vary widely but soils low in silt and very fine sand (.002 to .1 mm) are preferred. There is reason to believe that silt may migrate in the finished mixture. Silt contents exceeding 2 times that of the clay fraction should be rejected entirely if alternate soil sources can be found. Sand specifications were those recommended by Blake (1977). Less than 3% should be finer than 0.1 mm or coarser than 2 mm, and particles .25 to 1 mm should comprise at least 60% by weight of the sand.

Using these guidelines, Blake and Taylor ran tests on sand, soil, peat mixtures varying in sand content from 75 to 97% by weight. Measured were degree of compaction, infiltration rate, saturated hydraulic conductivity, and air filled pore volumes. The results showed that a minimum of 87% sand by weight was necessary to provide physical properties important to turf grass growth. Sand, soil, peat mixtures with less than 87% sand had infiltration rates less than 2.5 cm/hour. Mixtures with 87% or more sand readily drained to yield more than 10% air-filled porosity at a water potential of -30 mbars. Data also showed that growth and quality of creeping bentgrass (A. *palustris)* were superior when grown on those mixtures having 87% or greater sand contents. Although sand, soil, peat mixtures with 87% sand gave good results, Blake and Taylor recommended mixtures with more than 90% sand to supply a greater safety margin for infiltration rate.

Since sand is the predominant component, Blake and Taylor developed a method of specifying a sand, soil, peat mixing ratio which enabled valid predictions of sand content in the final mixture. In Figure 5, sand content of the soil component has been plotted against the volume of sand needed, in addition to 1 volume soil and 1 volume peat, in order to give final soil mixtures by mass. Mean sand, soil, and peat bulk densities of 1.57, 1.19, 0.16 Mg/m^3, respectively, were assumed. The error in estimating the sand content of a soil mixture caused by the above assumptions would rarely exceed $\pm 2\%$ in the sand content of the resulting mixture where a sand content of 90% or greater was specified.

By knowing the sand content of the soil component, one could immediately determine what sand, soil, peat mixing volumes would be needed in order to achieve a final mixture of specified sand content by mass. For example, to achieve a final mix containing 92% sand when using a soil containing 50% sand, you would need 5.5 volumes of sand to one volume of soil and one volume of peat. See Table 5, Page 11

References

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2. Taylor, D. H., and Blake, G. R. 1981. Laboratory evaluation of soil mixtures for sports turf. Soil Sci. Soc. Am. J. 45:936-940.

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4. Blake, G. R., and Taylor, D. H. 1984. Predicting sand content of modified soil mixtures from sand, soil, and peat properties. Agron. J. 76(July-August):583-587.

EDITORS NOTE: The work reported herein by Blake and Taylor as summarized by Vandehey is excellent research. It conforms very closely to recommendations of Washington State University and Oregon State University. The editor would like to caution the reader that the major catch in this system is thorough and uniform mixing or blending of the individual components. Even without adding the soil factor, we have observed many sloppy mixtures of sand and organic matter, and when we add the third ingredient, soil, more serious problems can result. With thorough mixing and proper management, there is no reason that this system should fail.

WINTER TURFGRASS MANAGEMENT AND YOU

By Roy L. Goss

There are many things the turfgrass manager needs to think about in preparing and managing his turfgrasses for winter. Every capable turfgrass manager should have a checklist of things he should have done by now and should be doing the reminder of the winter. Some of these things will include making sure the irrigation system is thoroughly drained and blown out or properly protected, equipment properly serviced with winter protectants, fall fungicides for snowmold and Fusarium treatments already in place and all of the other good management programs accomplished.

NUTRITION

What about nutrition? Since the growing season is essentially at a close in most areas of the Pacific Northwest, do you simply breathe a sigh of relief and say, "Well, we don't need to worry about that until March or later." Or, are you one of those who are really planning your strategy for the rest of this winter and 1985. All turfgrass areas east of the Cascade Mountains should have received fall fertilization around the second week of November, just about the time the grasses were slowing down in their fall growth. It is not too late to make the fall fertilization in areas west of the Cascade Mountains. In general, 1/2 to 3/4 lb of available nitrogen per 1000 ft^2 can still be applied to all turfgrasses in the Coastal areas through December. The only restriction being frozen soils. As long as the soils are not frozen, fertilization programs are still effective. This late fall fertilization is very essential for good root growth and to provide some nitrogen when the frost is out of the ground in early spring. Most of the nitrogen applied in the late fall or early winter is incorporated within the plant system and can be utilized for much needed root growth and adequate shoot growth come early spring. Applications of fertilizer in early spring usually stimulate excessive top growth without enhancement of adequate root growth.

We would be remiss to say apply nitrogen only; therefore, soil test will verify the need for phosphate and potash as well. The smart turfgrass manager will have included substantial amounts of potash in their fall fertilization program unless soil test values are high. It is a known fact that higher levels of available potassium will help prevent winter injury, including disease suppression.

WINTER DESICCATION

Severe winter desiccation occurred in many areas west of the Cascade Mountains in December of 1983 and in other years in January, and can occur anytime that adequate snowfall is not present on through the month of February. Areas east of the Cascades can suffer severely from winter desiccation any time from mid-November through March if protection is not provided. Golf course putting greens suffer most from desiccation due to shallow root systems and little insulation factor against rapid water loss from the soil surface, crowns and upper rooting profile. Turfgrass areas dominated by *Poa annua* are more severely injured than those dominated by bentgrasses, Kentucky bluegrasses, fine fescues and even turftype perennial ryegrasses. There are many covering agents that can be used to prevent desiccation, but we should not forget the addition of small amounts of water in any method that you can apply them to turfgrass areas not covered by snow and are obviously beginning to desiccate.

We have had but a small taste of winter so far this year, but much worse could come. You need to remind your clientele of the dangers of playing frosted and frozen turfgrasses and close the use of these facilities until it is safe to resume use. In order to condition your clientele and achieve better cooperation and understanding, this preconditioning communication should be started early in the fall and you will have much less grumbling and discontent when you do have to close your facilities.

Let's hope that you have accomplished all of the things above and that winter of 1984-85 is very kind to all of you and that your facilities will look great in the spring and summer of 1985.

LIMING OF TURFGRASS AREAS

By Roy L. Goss

Lime, regardless of the form, serves mainly two purposes: 1) decreases acidity by raising the pH, and 2) supplies the nutrient calcium. The fate of lime applied to turfgrasses is dependent on soil texture and mineralogy, organic matter, the degree of leaching, and application of acidic materials. Soils with optimum amounts of clay and humus provide exchange sites for calcium and retain this element if applied. Sand has few exchange sites and cannot retain significant amounts of any element (nutrient). Some highly acidic heavy textured soils have a high aluminum content and neutralize large amounts of calcium as well.

Fall, winter and early spring are excellent times for turfgrass managers in the West Coast area to start correcting pH, calcium or magnesium deficiencies. Interior areas east of the Cascade Mountains can begin their applications in early spring when the frost is out of the ground and accomplish the same purpose. Soil tests will indicate your choice of liming materials. If your soil test indicates that the ratio of calcium to magnesium is more than 7:1, it would probably be a good idea to use dolomitic limestone as your choice of material. If it is as close together as 5:1, agricultural limestone is cheaper and will accomplish your purpose.

Liming turfgrass areas is considerably different than your home garden or agricultural lands. We have little opportunity to work the liming agents into the full rooting profile or even the upper 4-6 inches. Therefore, these materials are placed directly on the surface or in the thatch. Applications exceeding 35 lb per 1000 ft^2 per application are excessive in the author's view and should not be practiced on existing turfgrasses. If your soil test indicates that you should apply 100 lb per 1000 ft^2, this amount should be applied in at least three equal applications over a one-year period and not in any single season. Limestone, either as calcium carbonate or dolomitic limestone (containing magnesium carbonate), dissolves very slowly and can form a layer if applied in too great amounts. Materials such as hydrated lime (calcium or magnesium hydroxide) are much finer materials and much more reactive than carbonate forms and have to be used with extreme care and caution to prevent burning. It is feasible to apply the hydroxide forms at rates of 3-10 lb per 1000 ft^2 per application depending upon the type of turf being treated with a reasonable degree of safety.

LIMING MATERIALS

A liming material can be defined as any compound of calcium or calcium and magnesium capable of counteracting the harmful effects of an acid soil. Any stone containing less than 80% of carbonates is considered low grade. Any stone containing over 95% of carbonates is always preferred.

Three Forms of Lime:

1. Oxide - calcium oxide or magnesium oxide - very hot, reactive, and disagreeable to handle.
2. Hydroxide - calcium hydroxide or magnesium hydroxide - very reactive and somewhat disagreeable to handle.
3. Carbonate - calcium carbonate or magnesium carbonate or combinations of both. This is the usual form that we purchase as agricultural lime or dolomitic limestone.

The oxide form of calcium is not commonly used in most agriculture because it is extremely caustic and very difficult to handle, while the hydroxide form of calcium is formed by slaking calcium oxide (adding water) and is also caustic and a little difficult to handle as well.

NEUTRALIZING POWER OF VARIOUS FORMS OF LIME

Liming materials are always calculated on the basis of pure calcium carbonate taken as 100%.

Form of lime	Molecular wt	Neutralizing value (percentage)	Lb equivalent to 1 ton of pure $CaCO_3$
Calcium carbonate	100	100	2000
Magnesium carbonate	84	119	1680
Calcium hydroxide	74	135	1480
Magnesium hydroxide	58	172	1160
Calcium oxide	56	178	1120
Magnesium oxide	40	250	800

EFFECTIVENESS OF LIME FORMS

1. Calcium stone is softer than magnesium stone and breaks down more quickly.
2. Fineness of grind effects the speed of reaction.
3. Calcium hydroxide reacts faster than finely ground limestone because calcium hydroxide is a more finely ground powder.
4. Calcium hydroxide forms calcium carbonate in the soil. Therefore, in the long run there seems to be little difference in the various forms of lime when applied in equivalent quantities.
5. Standard grades should meet these screen tests: 100% passing No. 10 and 30-50% passing a No. 100 screen.
6. Soil reaction proceeds more rapidly in soils high in organic matter due to large amounts of CO_2 produced.
7. Excess lime can reduce the availability of manganese, zinc and iron and sometimes phosphates.
8. State law requires that the analysis of the lime be shown either as percent calcium carbonate or calcium carbonate equivalent.

Other forms of lime such as liquid lime or pelleted lime are also effective and sometimes convenient to use, but it is your responsibility to look at the calcium carbonate equivalent and the bottom line, which is cost.

OFFICERS OF THE NORTHWEST TURFGRASS ASSOCIATION

Gary Sayre ..... President
Mark Snyder ..... Vice President
Gene Howe ..... Treasurer
Dr. Roy Goss ..... Exec. Secretary

NORTHWEST TURFGRASS TOPICS is sponsored by the Northwest Turfgrass Association and financed through funds of this organization. Any communications concerning distribution of this paper or association business should be directed to P.O. Box 397, Puyallup, WA 98371, or Roy L. Goss, Western Washington Research and Extension Center, Puyallup, WA 98371.

Communications concerning content of this paper should be directed to Dr. Roy Goss, Editor, Western Washington Research and Extension Center, Puyallup, WA 98371.

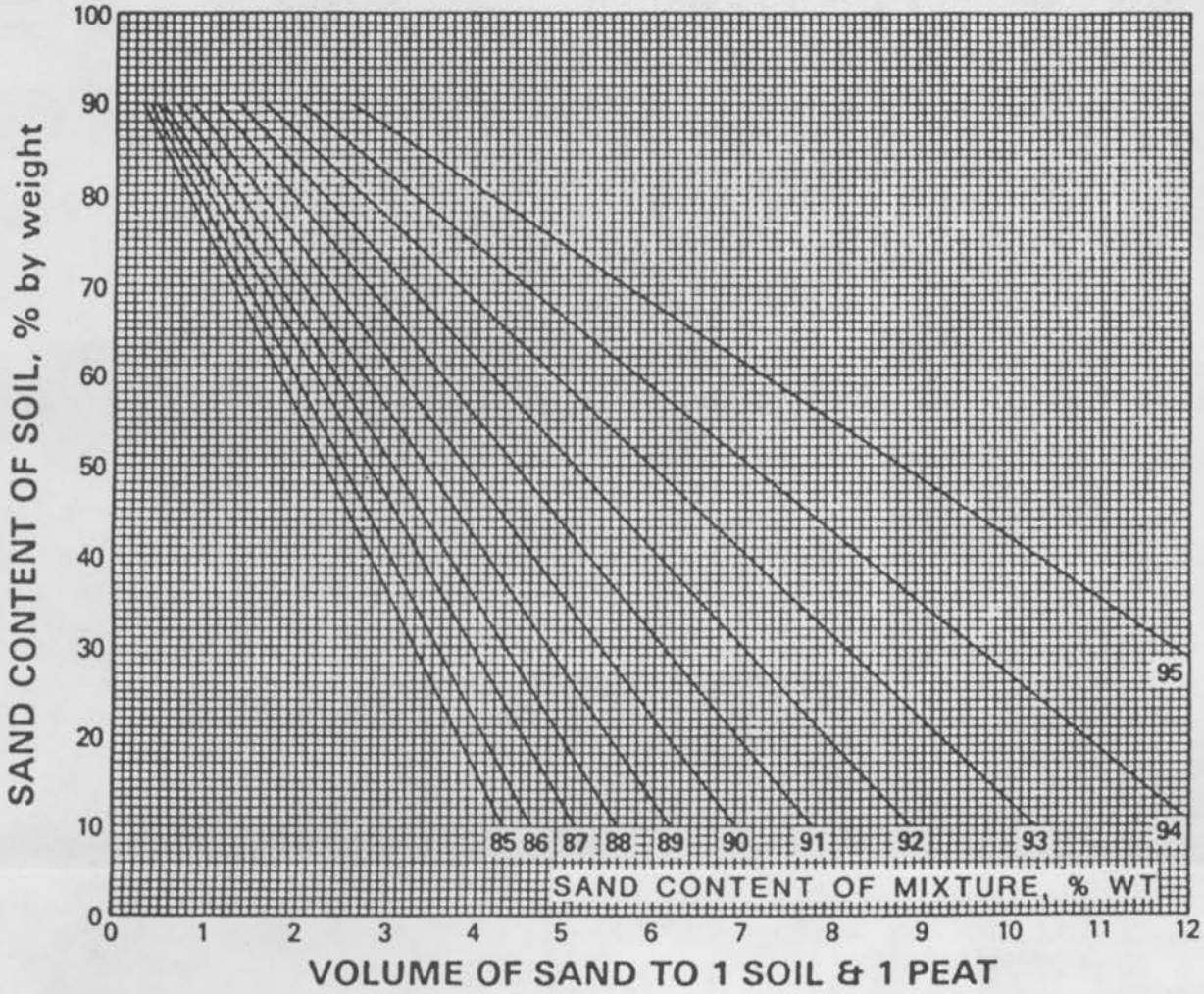

Fig. 5. Volume ratios of sand-soil-peat required to achieve sand contents of 85 to 95% by mass in the soil mixture as influenced by sand content of the soil component.

Season's Greetings & A Happy & Prosperous New Year

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