
'Almost right' was not Pat's way. That insistence on perfection was an excellent method of instilling the importance of doing whatever it takes to establish and maintain a strong turf program."

Zwaska is enthusiastic about "The Brickyard." This new stadium combines the latest in turf technology with an "old-time" look so natural, you would expect Babe Ruth to come out of the dugout. (Actually, Ruth's father once owned a bar on a spot near the current center field.)

"There are advantages in starting from scratch," Zwaska says. "We've definitely done better than we could have done before PAT (Prescription Athletic Turf)."

### New System Rejuvenates The Old Field

Laurel Meade or Turfgrass Services Company, Inc., Pueblo, CO, was issued the PAT system marketing franchise right by Purdue University. Only designated franchises are authorized to install the system.

Zwaska and his crew worked side by side with STN Sports, a division of Southern Turf Nurseries, the franchise who handled the PAT system installation.

Danny Woodall, field operations manager for STN Sports says, "Being on-site on a daily basis is the best way to maintain a good working relationship between the architect and the owner—and to insure the best possible finished product."

Adds Don Roberts, agronomist for STN Sports, "We definitely want the groundskeeper on hand throughout the process."

It would have been impossible to keep Zwaska away even if he was asked. He knew every inch of the old field, how it functioned, and what was needed to keep it in prime condition. He's committed to the same in-depth knowledge of the new field. To miss any part of the installation process would have been unthinkable.

All three agree that it's vital to be on-site to develop a total understanding of how the system operates. Also, if anything is unclear in theory, the groundskeeper has discretion to assure that adjustments deliver what he needs.

Roberts says, "The project took six months. Paul, his crew, and the whole Orioles operation were great to work with."

The 117,000 square feet of natural bluegrass sod grows on 9,000 tons of sand above a 2.69-acre, five-millimeter-thick, cross-laminated, reinforced polyethylene liner. A complex, subirrigation network—including 10,000 linear feet of two-inch PAT pipe, 2,000 linear feet of four-inch drain pipe, and 2,000 linear feet of six-inch drain pipe—allows water to be released or absorbed automatically according to sensor readings, or overridden manually to fill specific needs. A 78-sprinkler head irrigation system can supply above-ground watering on demand, either triggered manually or tied into the automatic system.

Over the last 18 years, the PAT system has continually improved along with state-of-the-art electronics. The Oriole Park PAT is the latest in design—a pits and vacuum system, using vacudraining to control moisture levels.

Roberts classified the project as "a huge undertaking." The two bullpens are raised above field level, giving the fans a view of the warm-up in process. There is also a 5,000 square foot elevated nursery growing the same bluegrass turf under the same conditions as the field turf, as a reserve for use in rejuvenation, if necessary.

"In effect, three separate zones for the bullpens and the nursery, on different elevations than the main field are all connected into the main drainage system," Roberts says. "It's the first time this has been done."

"So far, the system has worked like a charm," says Zwaska. "We used the water-absorbing vacuum for the first time during the early May home stand. The players marvelled at the field. At our old facility, the field would have been mushy all week."

Zwaska continues, "We installed an artificial warning track in combination with the natural turf field. This way, we have no stone to replace. At the old park, we washed away 100 tons of stone dust each season. The artificial track is neater, cleaner, much easier to maintain, and eliminating the dust-filled runoff is better environmentally. We are getting a few extra ground rule doubles because of the extra bounce, though."

### Dedication From The Whole Team

The Orioles groundskeeping crew normally works out about eight months of the year. Unless the Orioles make the playoffs and World Series, the season stretches from March 1 to November 1. During those working months, each crew member puts in from 2,300 to 2,5000 hours—working day and night on game days. (That's the equivalent of 50 weeks at 46-50 hours per week.)

"If there's any downside to the installation of the PAT system, it's that our crew lost the winter off," says Zwaska. "But the opportunity for the groundskeep-

*continued on page 12*

**Paul Zwaska (in black hard hat) awaits next piece of sod to be laid on the infield. Photo courtesy Ronnie Potter.**

**PAT lines over the polyethylene liner. Photo courtesy Don Roberts, STN Sports/Southern Turf Nurseries.**

## Zwaska Profile

*continued from page 11*

ing team to be in on the field development from the ground up more than makes up for it. They're a first rate crew; eager to grow with the program."

Sports turf management is always complex, subject to constant change—including the whims of nature and the effects of play. As always, Zwaska is thriving on the challenge.

"With the PAT system, the sports turf manager has at his command a high-tech tool box containing all the tools," says Roberts. "The end results of the PAT system are not in the basics of the design, but in how the turf manager uses the tools. Paul is really on top of it all."

Zwaska adds, "This profession intrigues and excites me as much now as it did when I was 10. Even though I'm in the pro area, I'll keep learning until the day I die."

That desire to keep the knowledge growing is what lead Zwaska to the Sports Turf Managers Association (STMA). "STMA is an excellent organization in which to share ideas and trade secrets. There's no better way to get acquainted with people in the industry," he notes.

Besides the national interaction provided by STMA, Zwaska promotes the advantages of getting active at the local level. He's currently a board member of the Chesapeake Chapter, and involved with designing the yearly awards ceremony, working with the quarterly meetings, which bring in high-level speakers, and the annual field day, which offers demonstrations and hands-on experience.

"If it weren't for the groundskeeper, no matter what the size of the facility, you wouldn't have a good playing surface," says Zwaska. "It's especially important at the local level to support and encourage anyone who does a good job, to get the word out about those people and their programs.

"STMA and its members have the information and 'ammunition' to help at the local level. We can assist in convincing a board or the funding people that sports turf management is vital and resources must be allocated to do the job properly."

The realities of the workplace demand the best possible combination of knowledge and experience. It takes commitment and dedication to strive for perfection in your field. For many people, that constant expenditure of effort becomes a drain. Paul Zwaska has managed to capture the enthusiasm and excitement he had at age10—and bring it to the job with him each day. ❑

**The Orioles' grounds crew standing on the newly completed pitcher's mound. Photo courtesy Ronnie Potter.**

# ORGANIC WETTING AGENT MAKES A SPLASH

At one point last spring, we went 40 days without turning on our irrigation system," states Pete Hernandez, superintendent of the Las Posas Country Club in Camarillo, CA. "You've got to make every drop of water count and use of wetting agents is a good way to accomplish that."

Hernandez estimates that he uses between 300 and 500 gallons of wetting agents annually. "The Las Posas course is very hilly and our greens are mostly based on heavy clay soil," Hernandez continues, "These soils are difficult to penetrate with water, and we constantly have to contend with dry spots and puddles."

The product Hernandez uses is an organic wetting agent and soil penetrant derived from natural plant extracts that offers several unique advantages to golf course managers.

Called NorburN*, the product does not have to be watered in at application. It is not phytotoxic to turf, and can be safely applied with most fertilizer and pesticide formulations, according to the manufacturer, ROOTSinc., a division of LISA Products Corporation in New Haven, CT.

"I've been very pleased with NorburN," says Hernandez, who uses it on most of his *Poa annua* and bentgrass greens. "Since we began using the product, I've had noticeably fewer dry spots and less trouble with puddling of water on the greens."

A natural product extracted from the desert Yucca plant, NorburN is nontoxic, biodegradable, and will not contaminate ground water, the manufacturer says.

"Given the tight water restrictions in effect in California, use of wetting agents can help golf course managers stretch limited water supplies and irrigation efficiency," says Wayne Wall, president of ROOTSinc. "Unlike chemical, alcohol, or petroleum-based wetting agents, NorburN does not have to be watered in at application. You can apply the product during the day and wait until night when sprinklers normally run to water the product into the soil."

Hernandez concurs, "I've used NorburN even on the hottest summer days and haven't seen any phytotoxicity. ❑

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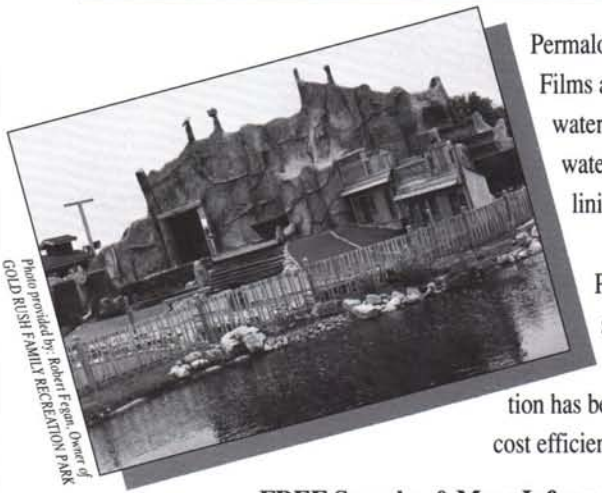


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# Soil Polymers For Turf Areas: A Technical Review

By Darrin Polhemus

Soil polymers absorb water, allowing roots access to stored water.

The increasing pressure to conserve water on irrigated landscapes forces sports turf managers to explore methods of getting the most out of each irrigation. One alternative being explored is soil polymers.

Soil polymers have been around for about 40 years. Recently, they have undergone some improvements. They are acknowledged to increase the water holding capacity of soils and, therefore, extend irrigation intervals.

There have been sporadic studies and data collection on the benefits and disadvantages of using polymers as a soil amendment. The main focus of this article will be to explore the use of polymers in large turf irrigation management programs.

There are five main types of soil polymers being commercially produced and distributed. The most commonly used polymer is the cross-linked polyacrylamide.

*Starch-grafted copolymers,

*Polyacrylates,

*Cross-linked polyacrylamides (gel-forming),

*Non-cross-linked polyacrylamides (water soluble), and

*Polyacrylontrile.

Copolymers, or combined polymers, are also possible and contain mixtures of different polymer types. Each has a slightly different mechanism for absorbing water with the potential for absorption being based on the types of polymer used.

## Water-Absorbing Ability

The absorbency of polymers depends on several factors. Under laboratory conditions, soil polymers can absorb hundreds of times their weight in water. However, there are several factors that influence this absorbency in the real world.

First, consider the type and quality of the polymer. A fair amount of variation can be found between different brand names and types of polymers.

A second factor is that all polymers drastically decrease in absorption ability when the water being absorbed contains salts. (Johnson, 1984). Most polymers absorb water in an attempt to dissolve. In the case of gel-forming polymers, they are held together by cross-links or some other form of chemical bonding between the polymer chains.

Many polymers also contain chemical groups that make them salt-like, placing them in a class of materials called polyelectrolytes. The ionic charges cause the polymer chains to stretch out in solution because the charged portions of the polymer tend to repel each other (Harwood, 1991). This effect causes cross-linked polymers that are in the polyelectrolyte class to swell much more than uncharged polymers with the same amount of cross linking. Whenever salts are present, the reactions between the charged portions are reduced considerably (Harwood, 1991).

In typical irrigation water, the absorption of a common cross-linked polyacrylamide will be around 80 to 200 times its weight in water. This is compared to laboratory test results showing an absorption of 600 times its weight of water when deionized water is used (Allied Colloids).

## Product Lifetime

Another property of soil polymers that varies by type is life span once the product is incorporated into the soil. Starch-grafted copolymers have the shortest life span, with a typical range of one month to one year. Their absorption rate slows down after installation, but the rate of reduction depends upon the soil and microbial activity. Such rapid decay of the starch-grafted copolymers is a result of the starch chains that make up its structure being easily digested by soil microbes.

Typical life spans quoted for cross-linked polyacrylamides are five to 10 years. Polyacrylates and associated copolymers are thought to last from two to five years. The life spans mentioned are approximations and depend on soil conditions.

Both cross-linked polyacrylamides and polyacrylate copolymers maintain

most of their water absorption ability until a period shortly before the end of their life when they begin to decay rapidly.

**Benefits of Polymers**

When polymers are incorporated into a soil, they increase the effective water holding capacity of the root zone. They do this by acting like miniature reservoirs that plants can draw from as they need water for transpiration.

You can view the addition of polymers as having the same effect as increasing a plant's root zone depth. It is this increase in available water to the plant that allows you to extend the interval between irrigations. (Note that the amount of water the plant uses does not change.)

Polymers can be helpful when dealing with potted plants (indoors or outdoors) or when establishing street trees where the expense of hand watering is significant. In these installations, there may be no automatic irrigation system and labor costs dominate the expense of keeping the plant watered.

In such cases, being able to irrigate half as many times per year is a true labor savings. However, for general landscape applications, automatic controllers turn irrigation systems on and off. In such cases, the water cost itself is the issue.

Polymers only extend the interval between irrigations and have only a minor effect on the total quantity of water required (Nus, 1990), resulting in negligible change in the annual cost of irrigation. Therefore, polymers tend to have fewer cost benefits in general landscape use. However, they can provide several types of appearance, soil structure and safety benefits.

One area where the use of polymers may be beneficial is in the treatment of dry spots, which are caused by areas where the soil has extremely low water-holding capacity. An example would be a turf site that has mostly a silty or clay soil with spots of an extremely sandy soil. In this case, a polymer application to the sandy area may bring the water-holding capacity of the sandy area up to or close to that of the adjacent heavy textured area. This would allow irrigation frequency to be based on the larger percentage of the turf area and might improve the appearance of the sandy area.

You could possibly justify general application of soil polymers under a set

*continued on page 16*


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## Polymers

*continued from page 15*

of multiple circumstances. If the soil of the area you are treating is extremely sandy and the number of days per week available for irrigation is severely restricted, then polymers may provide a viable solution. They will provide a larger *gas tank* for storing irrigation water.

However, polymers used for large areas may be costly (approximately $2,000 to $5,000 per acre when installation is included) if you apply them in sufficient quantity to significantly increase the water holding capacity within the turf root zone.

Another possible benefit of soil polymers is the appearance of turf in treated areas. It has been reported that areas of turf seem to hold a better appearance for a longer period of time and tend to show fewer signs of stress than untreated areas (Nus, 1991). This does not have any relation to the amount of water plants use.

### Polymers and Soil Structure

Another possible benefit is the effect polymers have on soil structure. The expansion and contraction of the polymer while in the soil has been reported to cause greater soil fracturing and possible reduction in compaction (Ellefson, 1990). A study by Dr. Tony Koski of Colorado State University indicated that polymers have an effect on the compaction of the soil. This could possibly increase root mass and organic material within the soils (Wofford, 1989).


**Subsurface polymer planter in action. Photo courtesy Ken Harrison, Hydrosource.**

### Polymer Elasticity

In a study at Kansas State University, Dr. Jeff Nus investigated the effect of polymers in turf as a way of reducing sport


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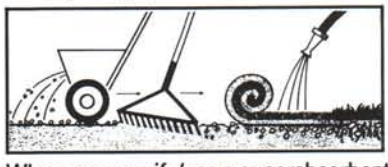

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injuries. A hydrated soil polymer has a consistency like a super strong jello. It will give a lot and does not burst or rip when pressure is applied. When mixed into the soil, polymers may add some shock absorbing ability to the soil. This extra shock absorption could be easier on athletes' knees, helping to prevent certain injuries that occur during turf sports (Nus, 1990).

### Possible Savings With Polymers

In a study to determine the allowable days between irrigations at different polymer application rates (Nus, 1990), it was found that 80 pounds per acre was required before any increase in water stored in the soil is noticed. However, applications this light are not recommended.

A *substantial* increase in water stored in the soil was achieved only when the application rate was raised to 320 pounds per acre. This amounts to approximately 7.5 pounds per 1,000 square feet. At this rate, the polymer increased the soil-water holding capacity by 0.25 inch of water. During a typical hot day in Southern California, a turf area could use 0.2 inch of water in one day. Therefore, a soil polymer applied at 320 pounds per acre will only extend the time between irrigations by about one day in the summer.

In general, there is not sufficient information to determine optimum polymer application rates based on soil type, root zone depth or irrigation water quality. The information provided concerning the amount of possible water absorption usually ignores the effects of salts in fertilizers, soils and irrigation water. Although it is generally recognized that salts reduce the water absorption of polymers, the question is how much the absorption is reduced in actual field use. This lack of knowledge has hindered the ability of landscape contractors to predict the actual economic performance of a certain polymer application rate at a specific site with a given water quality, soil texture and fertilization.

Although soil polymers increase the water holding capacity of soils and extend the possible time interval between irrigations, they do not significantly change the fundamental variables affecting plants' irrigation water requirements. The total water required per year is about the same. The amount of water applied can be reduced if there is overirrigation.

When you consider soil polymers for turf sites with automatic irrigation systems, evaluate polymer use on the basis of being able to reduce compaction, help prevent sports injuries, improve turf appearance in specific *hot spot* areas, and increase irrigation scheduling flexibility. ❑

*Darrin Polhemus was a student at the California Polytechnic University, San Luis Obispo and a part-time staff member at the university's Irrigation Training and Research Center, Agricultural Engineering Department when he wrote this article. Robert Walker and Gary Kah, both of the ITRC at Cal Poly, edited the article.*

**REFERENCES**

The following studies were cited in this article:

1. Allied Colloids, General Industries Division. Technical Report: Alcosorb AB3 water retentive polymer.
2. Ellefson, Connie Lockhart. 1990. Update on landscaping uses of cross-linked polyacrylamides. Western Polyacrylamide, Inc. Castle Rock, CO.
3. Harwood, James. 1991. Personal communication. Institute of Polymer Science, University of Akron, Akron, OH.
4. Johnson, Michael S. 1984. Effect of soluble salts on water absorption by gel-forming soil conditioners. J. Sci. Food Agric. 1984, 35,1063-1066.
5. Nus, Jeff, Mike Boaz, and Dan Wofford. 1990. Unpublished report.
6. Nus, Jeff, Mike Boaz, and Dan Wofford. 1991. Water absorbing polymers show promise in turf. Golf and SportsTURF, 7(6):18-23.
7. Wofford, Daniel J. 1989. Landscaping uses of cross-linked polyacrylamide in the Western United States. Western Polyacrylamide, Inc.


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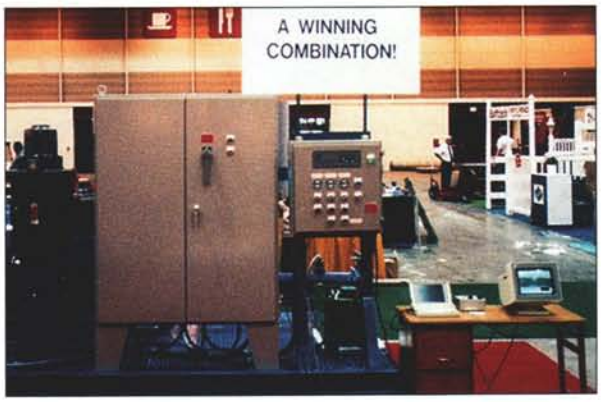


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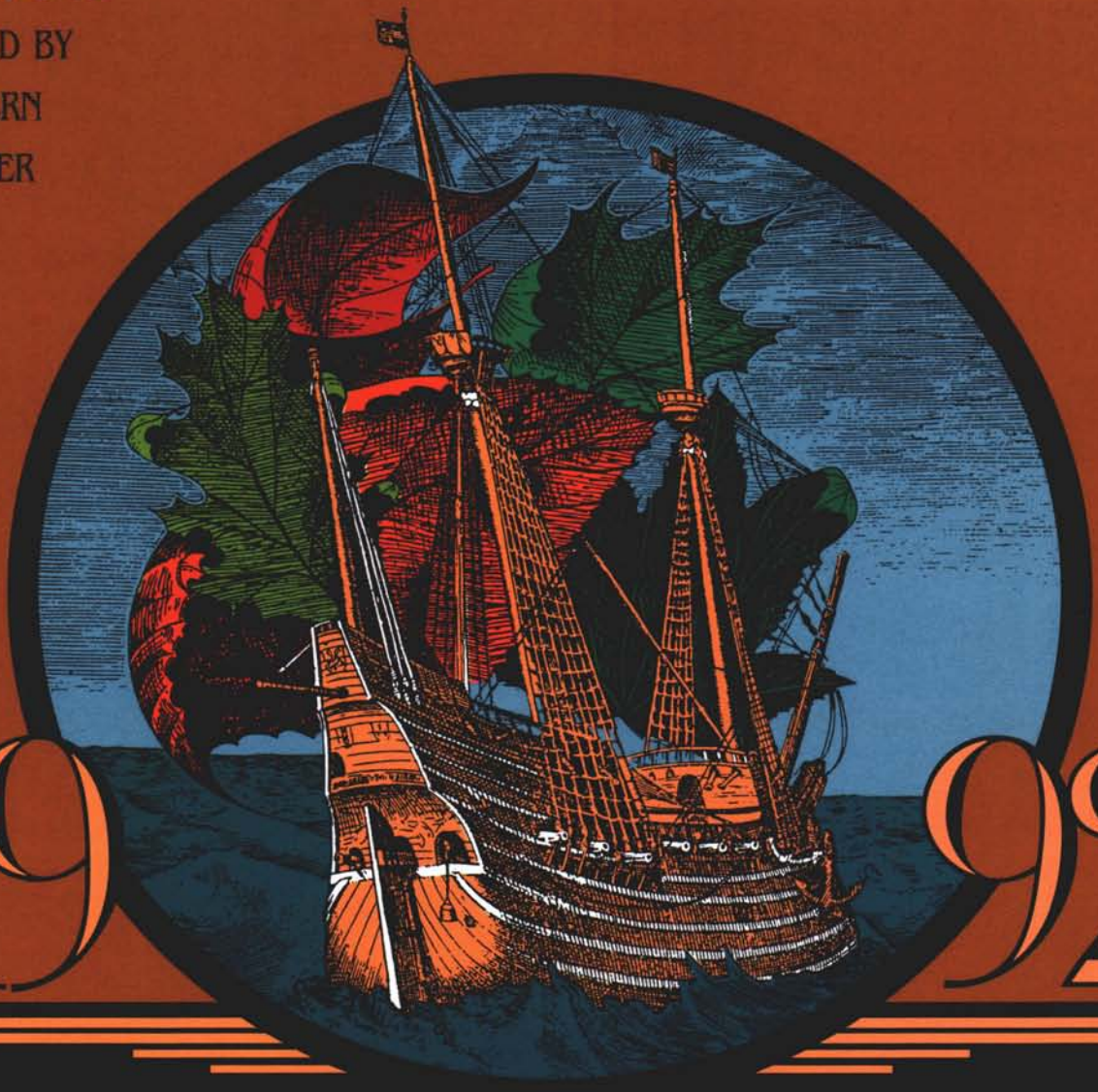

# 1992

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# SATURDAY, AUGUST 8

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### Course A—Using the New Tree Evaluation Guide

This workshop will focus on the use of the new tree appraisal method that will be described in the next edition of "Valuation of Landscape Trees, Shrubs, and Other Plants" scheduled to be released at the ISA Conference.

### Course B—Implementing Tree Management Systems & Designing Energy Efficient Landscapes

The morning session will focus on "Implementing Tree Management Systems" and will discuss specific case histories of tree inventories successfully implemented as tree maintenance programs. The afternoon session, "Designing Energy Efficient Landscapes" provides arborists, especially utility and municipal arborists, with information to become more knowledgeable advocates of urban forestry programs for energy conservation.

### Course C—Assessing Trees for Hazard

This workshop will use ISA's *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas*, as a starting point in assessing hazard. Field work will analyze specific trees to assess their hazard potential.

### Course D—Rigging, Cabling/Bracing, Pruning

(Select two of these half day sessions)

***D-1—Pruning to Reduce Hazards***

Tree hazards can be eliminated or significantly reduced by pruning when trees are young, or by corrective pruning of older trees.

***D-2—Safe Practices in Rigging and Removal***

Removing trees or tree limbs in tight places can be particularly troublesome and hazardous. Proper rigging techniques can save time and money; and make the removal safer for the tree crew.

***D-3—Cabling & Bracing***

Cabling and bracing are common techniques preserving trees with structural defects. Proper selection and use of hardware, as well as cable system design, will be discussed both in the classroom and in the field.

# SUNDAY, AUGUST 9

## "Field Day"

The **INTERNATIONAL JAMBOREE** begins at 9:00 AM in Lakeside Park at beautiful Lake Merritt. Four exciting events match the skills of the top tree climbers from the United States, Canada, and Europe in this competitive series.

**EQUIPMENT DEMONSTRATIONS** begin at 9:30 AM. This is a unique opportunity to actually operate the equipment of approximately 20 manufacturers. Demonstrations end at 4:00 PM.

**EDUCATIONAL SESSIONS** at Lakeside Park will be conducted from 9:30 AM to 3:45 PM. Some of the sessions planned for both the morning and afternoon are:

- Chain Saw Safety Demonstration (will include demonstration of European safety wear)
- How to Evaluate Root Collar Tissue
- Chipper Safety Demonstration
- How to Evaluate Soils
- Root Collar Investigation Techniques

A **PICNIC LUNCH** will be served from 11:45 AM to 1:30 PM.