**Cold stressed at the Maine turf conference**

**By Mark Leslie**

Rockport, Maine — Hardening off cool-season turfgrasses is the most important factor in turf surviving a winter of freezing stresses, according to Dr. William Torello, turf program director at the University of Massachusetts at Amherst.

Speaking at the Maine Turfgrass Conference and Show here March 7, Torello said superintendents should make every effort to accumulate volumes of carbohydrates within the turf plant. Higher carbohydrate levels mean less internal ice crystal formation — "the kiss of death" — within the plant, he said.

Torello told superintendents to enhance the hardening process by:
- Increasing mowing heights, which "does great things for you. Even if you only bring it up 1/8 inch, it makes a big difference because you have increased leaf area and green tissues, which means higher carbohydrate production during the fall, increased storage, and increased concentration of stored carbohydrates in the crown which is going to give you a much better-prepared turf."
- Decreasing or eliminating soluble nitrogen (N) applications as the fall progresses. "Make no N applications after Oct. 15 — earlier in Maine," he warned. "How does nitrogen interfere with the hardening process? The more N picked up by the plant, the more protein it makes. Protein is made by taking carbohydrate and attaching ammonia nitrogen to it. It takes away carbohydrate." Dormant applications are an exception, he said.

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**Determined: All sprinklers are not 'created equal'**

**By Al Kline, CGCS**

Technical advances in irrigation equipment closely parallel the rapid gains made in all areas of turf management. Today, many of us think most, if not all, mysteries have been solved and maybe things have become a bit ho-hum. Yet, why do we continue to be plagued with "localized dry spot," wet areas, dry areas (that require continuous attention from "hot spot" or "sponge" crews), less-than-acceptable results from pesticide and fertilizer applications, black layer, and just plain old-fashioned non-uniform turf?

Well, bowdy to the real world where so many of us are frustrated and looking for answers. Indeed, a few people think sprinklers may be the key to solving the unsolvable and should be put under the old magnifying glass!

That's what we did at the University of New Mexico Championship Golf Course. Tim Cavelier, a local Toro irrigation specialist, and I built what appears to be the best outdoor sprinkler test stand in the world and are using the SPACE (Sprinkler Profile And Coverage Evaluation) computer program for sprinkler head evaluation as produced by The Center for Irrigation Technology at California State University-Fresno. Key players at CIT whom we have worked with, and are indebted to, are Dr. Ken Solomon, Dave Zolodski and Joe Oliphant.

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**Beating the water woes in Nevada**

**By Alton Pryor**

Laughlin, Nev. — Emerald River Resort and Country Club stretches for four miles along the Colorado River where it is carved out of rough and unforgiving desert. Built in 1989 on 380 acres of frozen base, it requires huge amounts of water to cope with high summer temperatures. For golf course superintendent Jay Long, water is his biggest concern. Even though he pumps from the giant Colorado River, flowing only a fairness from the course, water is an expensive commodity and Long has had to discover ways to reduce that expense.

"We pump out of the river, but cost for water is very high," Long said. "I'm budgeted $250,000 a year for water and that's not enough. We are charged $1.94 per thousand gallons, which is the residential rate, and the pumps on the pumps to make sure we don't cheat. When the courts broke up the water rights among the states on the Colorado River, Nevada didn't get a very big share."

Long said he applies about 50 acres feet per year to his green areas — about 75 acres. During the summer, when temperatures soar to as high as 125 degrees, Long said he applies about 50 acres feet per year to his green areas — about 75 acres. During the summer, when temperatures soar to as high as 125 degrees,
Sprinkler deficiencies
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MAINTENANCE

Ed. — Determining that sprinkler selection is "too often no better than Russian roulette," Certified Golf Course Superintendent Al Kline of University of New Mexico Golf Course in Albuquerque joined forces with Toro irrigation specialist Tim Cavilleri and staff at The Center for Irrigation Technology (CIT) at California State University-Fresno. Their aim: to improve the efficiency of the heart of golf courses, the irrigation systems. The result of their work is some fascinating findings, conclusions and recommendations. Here is Kline's report.

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water application; courses in New Mexico and Colorado, getting documented answers.

Really good sprinkler uniformity, from our testing to date, is the exception rather than the rule. The following summary illustrates some of our sprinkler test stand findings:

• Pressure changes of plus or minus 5 pounds or more at the base of the sprinkler head will usually affect uniformity—sometimes good, sometimes bad.
• The size and configuration of a "swinging-joint" can and usually does affect uniformity. (Note: Most, if not all, sprinkler heads tested do not have "swinging joints" attached during the test.)
• Nozzle rotation, as little as 1/8 inch, can and usually does affect uniformity. (Note: If not all, sprinkler heads tested do not have "swinging joints" attached during the test.)
• The speed of rotation can and usually does affect uniformity.
• A difference in the bore surface (rough or smooth) of a nozzle, same size compared to same size, can and usually does affect uniformity.
• Elevation affects uniformity. (Note: Most heads are tested at sea level. More work needs to be done on this.)
• Existing systems that are lacking in uniformity (and most are lacking) have great potential for improvement, that is, nozzle change, pressure change, internal change, etc. SPACE shows the problems and enables you to make improvements.
• All sprinklers are not created equal (specifications without a definite CIT rating are most often meaningless); and further, each sprinkler will probably have only one nozzle at one pressure (out of all the nozzles and pressures listed in the catalogue) that will give you a really good uniform application of water.

At this time it appears that if a CIT
— Coefficient of Scheduling of 1.10 to 1.30 (10 to 30 percent inefficient) is an acceptable performance range, then sprinkler manufacturers would do us a favor by reducing their product offerings by 70 to 80 percent.

• Testing confirms that there is greater potential for very good uniformity relative to smaller nozzles and low heads. This, however, is not an automatic result; and in the absence of testing you will not truly know.

Our test results:
• For a number of reasons, manufacturers don't often give definite uniformity information. (If you don't believe this, pick a page out of your favorite catalogue and request to see profiles at all pressures and nozzles listed, densograms and scheduling coefficients on all those same heads at a spacing selected by you.)
• We find different uniformity between new sprinkler heads "right out of the box."
• Production changes and/or flaws caused during the manufacturing process can and usually do change uniformity...
• A sprinkler head with excellent uniformity (great descending wedge pattern, etc.) may show "swing joint" can and usually does affect uniformity. (Note: If not all, sprinkler heads tested do not have "swinging joints" attached during the test.)

CIT reports:

1. Testing sprinkler heads before installation should be the rule and not the exception. (Note: If you don't believe this, ask for the print-outs and uniformity data that the designer used in sprinkler selection for your system). If there is data to be found, look at it, ask questions, find comparisons.

2. Until the end users of sprinklers become more knowledgeable and begin to request and specify uniformity instead of uniformity (low scheduling coefficients — 1.1 to 1.3 at no more than .50 inch per hour precipitation rate) as a primary requirement, we will continue to waste water and money and be plagued with turf problems directly related to poor uniformity.

3. There should be at least one sprinkler test stand available at each community. It's time to expect more from our sprinklers. Reducing our water use by 25 to 50 percent is a realistic goal with the technology now available. Let's get with it and make our water go further.

4. Beware of so-called "custom-designed" systems which usually include the use of two systems on a green and tout the virtues of one nozzle-approved nozzle. Hard copy, CIT-type test data will likely send a shiver down your spine.

5. Beware of the trendy reply, "Oh yes, these sprinkler heads have been tested." Every nozzle has a "swing joint" can and usually does affect uniformity—sometimes good, sometimes bad.

6. Beware of the trendy reply, "Oh yes, these sprinkler heads have been tested." Even if by CIT, there may be flaws. Because they haven't told you anything yet. You want to know if it was a good or bad test, how many alternatives were looked at for the nozzle you're considering, at your elevation, with your size swing joint, with your pressures which do vary at different elevations, etc. You must have hard copy of these tests in order to do your job.

7. There is no substitute for uniformity—demand it.