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FRESNO STATE
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CENTER FOR IRRIGATION TECHNOLOGY (CIT)

DANCAR MAT TRIAL REPORT

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Introduction

The **Center for Irrigation Technology (CIT)** submits the following report in fulfillment of the agreement between Dancar and the California State University, Fresno Foundation.

Objective

The Center for Irrigation Technology was enlisted to conduct a mat irrigation trial on turf grass and collect data to evaluate the efficacy of mat irrigation on turfgrass performance and water requirement.

Experimental Site/Plot Layout

The field trial was conducted on turf plots east of the Center for Irrigation Technology office on the University Agricultural Laboratory (UAL) at Fresno State from June, 2016 (planting) through November, 2016.

Materials and Methods

Irrigation matting, supplied by the vendor, was installed in the south half of turf plot #7 (30'x30') (Figures 1, 2, and 3) in June 13, 2016. The north half of turf plot #7 (30 ft x 30 ft) was irrigated with Toro I-20 rotors. The north half of the turf plot was irrigated based on climatological data provided by the California Irrigation Management Information System (CIMIS). The south half of turf plot #7 with the mat system was irrigated to attain a similar visual appearance to the north side.

Monthly turf quality evaluations began in August, 2016 using the National Turfgrass Evaluation Program (NTEP) guidelines (see appended document). A photo of the plot taken on December 1, 2016 is shown in Figure 4.

The turf irrigation proceeded following a schedule dictated by ETo in order to give the new sod adequate time to root sufficiently. The modified irrigation schedule for the mat system was implemented beginning in August. The south half of turf plot #7 was irrigated at approximately 50 percent of the control section.

Figure 1. Mat before sod is laid, June 2016

Figure 2. Laying sod, June 2016

Figure 3. Mat installed, June 2016

Figure 4. Photo taken December 1, 2016 showing sprinkler on left and Dancar mat on the right.

Results

The turf quality of the Dancar Mat treatment was very similar to the I-20 treatment (see Table 1). The major difference was the reduced weed population in the Dancar treatment. The applied water in the Dancar treatment was about 50 percent of the applied water in the I-20 treatment (see Table 2).

Table 1. Monthly National Turfgrass Evaluation Program (NTEP) data

	PLOT	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
MAT	7S	8.6	8.6	8.3	8.7
I-20	7N	8.6	8.6	8.1	8.7

Table 2. Monthly water use data (gallons)

	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL
MAT	2899	4924	8237	2233	1874	880	20,167
I-20	4871	9612	17941	6221	3049	1974	41,694

NOTE: This test report shall not be reproduced, except in full, without written approval of the Center for Irrigation Technology director.

Appended: Morris, Kevin N. and Robert C. Shearman. **National Turfgrass Evaluation Guidelines.**

NTEP Turfgrass Evaluation Guidelines

Prepared by:

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Introduction

The National Turfgrass Evaluation Program (NTEP) is a leader in evaluation of turfgrass species. The turfgrass industry in the USA and many parts of the world rely heavily on NTEP data. The information collected and summarized by NTEP is currently requested in thirty countries.

Turfgrass breeders, researchers, and extension specialists use NTEP data to determine adaptation and use of cultivars and experimental lines. Seed companies rely on this data for advertisement and sales. Government agencies, like highway and parks departments, use NTEP data when writing specifications for bids and purchasing. Most importantly, end-users, like golf course superintendents, sports turf managers, sod growers, lawn care service operators, and grounds managers, frequently use the data before purchasing seed or sod. It is the interest of all of these users that has made NTEP data the standard for the turfgrass industry in the USA.

The quality and scientific merit of NTEP data is extremely important. However, the evaluation of turfgrass species and cultivars is a difficult and complex issue. Furthermore, turfgrass evaluation is generally a subjective process based on visual estimates of factors, like genetic color, stand density, leaf texture, uniformity and quality. These factors can not be measured in the same way as other agricultural crops. Turfgrass quality is not a measure of yield or nutritive value. Turfgrass quality is a measure of aesthetics (i.e. density, uniformity, texture, smoothness, growth habit and color), and functional use. The most common way of assessing turfgrass quality is a visual rating system that is based on the turfgrass evaluator's judgement. Subjective measures of this type are always subject to criticism and concern. However, it is a well-established fact that properly trained observers can effectively discern subtle differences between turfgrasses, using the visual rating system.

It is the overall goal of this document to provide guidance in the use of proper procedures and criteria for turfgrass evaluation. It is hoped that new turfgrass scientists will develop their evaluation skills, and that more senior scientists will hone their turfgrass evaluation capabilities.

Things to Consider

Visual ratings require consistency to ensure their merit. One person should take the data for a study. Avoid changing the person collecting visual ratings during the course of a growing season. Ideally, the same person should collect the visual ratings until the study is terminated. Keep a photographic record of treatment differences. Photos or slides are helpful in tracking treatment differences.

Before taking data, **observe** the study. Do you see visual differences in color, density, uniformity, disease incidence, environmental stress or other factors? If so, your visual ratings should reflect these differences. **Walk** around the treatments. **Identify** the range of differences that you see. What are the best and worst treatments? What treatments are in the middle of the range? You may wish to mark these plots to use as a reference. You can refer back to them as you rate the study, keeping your ratings as consistent as possible. This process allows you to establish your rating range for each time that you rate the treatments.

Visual ratings are based on a 1 to 9 rating scale. One is the poorest or lowest and 9 is the best or highest rating. Use as much of the rating scale as is reasonable and feasible. Base your range on the overall differences that you observe. It is important that you do not compress the rating scale. **Rate only in whole numbers**.

It is ideal to conduct visual evaluations on cloud-covered days, when shadows and reflections are minimal. Take data between midmorning to early afternoon, when the sun is at its highest. Keep the sun at your back. Avoid recording visual ratings on partially cloudy days. The intermittent cover causes sun flecks, and periods of brightness and shadows, making it difficult to evaluate treatment differences. It is best to have some one record data or use a data recorder. This approach speeds up the data collection and reduces glare resulting from glancing back and forth between paper and green verdure.

With some characteristics, like genetic color, differences are more evident prior to mowing. Mowing direction causes difference in light reflection and may influence color ratings. If the turf is mowed prior to rating, it is best to mow replications in the same direction. This will minimize reflection differences.

Turfgrass Quality

Quality is based on 9 being best and 1 being poorest. A rating of 6 or above is generally considered acceptable. A quality rating value of 9 is reserved for a perfect or ideal grass, but it also can reflect an absolutely outstanding treatment plot. The NTEP requires quality ratings on a monthly basis.

Quality ratings will vary based on turfgrass species, intensity of management and time of year. Within species quality ratings are relative. Among species they are not. For example an acceptable quality rating of 6 within tall fescue cultivars is not relative to the same value given among Kentucky bluegrasses. An acceptable quality rating value for a utility turf differs from the same value for a bentgrass putting green.

Quality ratings take into account the aesthetic and functional aspects of the turf. Quality ratings are not based on color alone, but on a combination of color, density, uniformity, texture, and disease or environmental stress. Turfs growing in a study may receive the same numeric

quality rating, but the factors influencing that rating may differ. For example, one turf may receive a quality rating value of 5 based on overall color and density, while another may receive the same value based on disease incidence and its impact on turfgrass density.

It is important to keep these facts in mind, when rating turfgrass quality. It is also important to keep this in mind when interpreting data from various studies.

Genetic Color

Genetic color reflects the inherent color of the genotype. It is based on a visual rating scale with 1 being light green and 9 being dark green. Take genetic color ratings when the turf is actively growing and is not under stress. Chlorosis and browning from necrosis are not a part of genetic color.

Color charts, like those sold by the Munsell Color Company, Inc., are helpful in describing turfgrass color and serve as a reference. Color charts are useful in maintaining consistent visual color ratings.

Turfgrass Density

Turfgrass density is a visual estimate of living plants or tillers per unit area. Dead patches of turf are excluded. A visual rating of 1 to 9 is used with 9 equaling maximum density. Turfgrass density can be determined quantitatively by counting shoots in a specified area. Counting is time consuming and labor intensive. Visual turfgrass density ratings are highly correlated to counts and require much less time and labor input. Shoot density varies by time of year. It is best to take density ratings in the spring, summer, and fall to account for seasonal variation. This is particularly true for cool-season turfgrasses.

Percent Living Ground Cover

Percent living ground cover is based on surface area covered by the originally planted species. It is generally used to express damage caused by disease, insects, weed encroachment, or environmental stress. Percent living ground cover is often measured in the spring, summer, and fall. This timing allows one to track the turfgrass response to various stresses during the growing season.

Turfgrass Texture

Turfgrass texture is a measure or estimate of leaf width. The visual rating of texture is based on a 1 to 9 rating scale with 1 equaling coarse and 9 equaling fine. Visual assessment of texture is difficult and less than precise. However, physical measurement is tedious, time consuming and labor intensive. Physical measurements are also variable. Care must be taken to measure leafs of similar age and stage of development. Visual ratings of texture can be used successfully to separate cultivars within species. Visual assessment of leaf texture should be done when the turfgrass is actively growing and is not under stress.

Other Color Data

Spring Green-up - Green-up is a measure of the transition from winter dormancy to active spring growth. It is based on plot color not genetic color. The visual rating of spring green-up is based on a 1 to 9 rating scale with 1 being straw brown and 9 being dark green.

Winter Color - An assessment of color retention during the winter months. It is based on a 1 to 9 visual rating scale with 1 equaling straw brown or no color retention, and 9 equaling dark green. It assesses overall plot color and not genetic color.

Seasonal Color/Color Retention - Seasonal color and color retention ratings are a measure of overall plot color. The scale used is 1 to 9 scale with 1 being straw brown and 9 being dark green. Seasonal color can be used to successfully differentiate color differences based on damage caused by disease or insect pests, nutrient deficiency or environmental stress. Color retention is used to assess the ability of the entry to hold color as seasons change. This is especially useful in quantifying the response of warm-season grasses to temperature changes or frost occurring in fall.

Other Data

Pest Problems- Pests include disease, insects and weeds. The NTEP reports disease and insect injury based on the turfgrass resistance, using the 1 to 9 rating scale with 1 equaling no resistance or 100% injury, and 9 equaling complete resistance or no injury. Insect incidence may also be determined as counts per unit area. **Always identify disease and insects to genus and species.** Verify the genus and species through the appropriate specialist (i.e. plant pathologist, entomologist, etc.). Weed infestation or encroachment is generally expressed as percent ground cover. Weeds should be identified to genus and species.

Environmental Stress- Stresses, like drought and winter injury, cause severe turfgrass damage. Turfgrass cultivars differ in their ability to tolerate and recover from these stresses.

Drought Stress- Drought stress resistance is assessed as wilting, leaf firing, dormancy, and recovery. A 1 to 9 visual rating scale is used with 1 being complete wilting, 100% leaf firing, complete dormancy or no plant recovery; and 9 being no wilting, no leaf firing, 100% green-no dormancy, or 100% recovery.

Winter Injury- Freezing or direct low temperature, desiccation, and frost injury can comprise winter injury symptoms. **It is important to identify the cause of the winter injury symptoms.** Turfgrass species and cultivars differ in their responses to each of these stresses. Direct low temperature and desiccation injury are generally expressed as a visual estimate of percent damaged ground cover. Frost injury is expressed on a 1 to 9 rating scale with 1 equaling 100% leaf injury and 9 equaling no injury.

Traffic Tolerance- Traffic tolerance is the combination of wear and compaction stress that occurs whenever a turf is exposed to foot or vehicular traffic. Wear injury occurs immediately upon trafficking a turf. Wear injury symptoms are often expressed within hours and

definitely within days. Compaction stress injury is more chronic. It is expressed over time. The NTEP reports traffic tolerance as visual estimate of turfgrass tolerance using a 1 to 9 rating scale with 1 being no tolerance or 100% injury, and 9 being complete tolerance or no injury.

Thatch Accumulation- Thatch is generally a measured value. Compressed thatch depth is preferred. It gives values with reduced variability. Collect 4, 5-cm plugs of turf-, remove the verdure; place a 1 kg weight on the surface of the thatch; and measure the compressed thatch depth in mm. Thatch accumulation measurements are time consuming and labor intensive.