Improvement of the Spring Transition of Overseeded Bermudagrass Putting Greens in the Coachella Valley

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in cooperation with

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TURF

ACKNOWLEDGMENT

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INTRODUCTION[z]

The spring transition of overseeded bermudagrass putting greens back to a monostand of bermudagrass is a concern and a challenge for golf course superintendents in the Coachella Valley. Actually, the spring transition is a common concern of golf course superintendents across the southern region of the United States.

Numerous articles concerning the overseeding of warm-season turfgrasses have been published in technical and trade journals. A review of selected reports, including a brief description of the work and the findings is presented in Table 1. General comments concerning the information in this review are listed below.

1. A strong, healthy bermudagrass is essential for a rapid spring transition. Healthy rhizomes, roots, and bud tissue associated with the crown are characteristic of a healthy bermudagrass prior to spring growth. Freezing, traffic, and extremely low mowing heights are examples of the numerous factors attributed to plant stress which can result in weak bermudagrass prior to spring growth. It should be noted that freezing stress may not be a dominant plant stress factor in the Coachella Valley and that relatively low mowing heights may be the standard for this region. Maintaining a strong, healthy bermudagrass in late summer and fall is recommended to help provide for a strong, healthy bermudagrass in the following spring. Recommendations for maintaining a strong, healthy bermudagrass in the fall normally involve good nutrition, higher heights of cut, and the least disruptive renovation practices.

2. Spring transition occurs when air and soil temperatures favor the growth of bermudagrass and discourage the growth of the cool-season overseed turfgrass. One paper reported that spring transition naturally occurs when soil and air temperatures are above 80ºF, when ryegrass roots begin to decline; while a second paper reported that competitive bermudagrass growth is associated with air and soil temperatures at about 90ºF. A third paper recommended that mowing heights should be lowered when night temperatures approach 60ºF. Though mowing heights are relatively low in the Coachella Valley, there is the possibility of coordinating the timing of other practices which hasten the spring transition to a threshold nighttime temperature. Cultural practices would then be employed when air and soil temperatures favor the growth of bermudagrass and discourage the growth of the cool-season overseed turfgrass.

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[z] From: Progress Report: Improvement of the spring transition of overseeded bermudagrass putting greens in the Coachella Valley. February 10, 1998. Also, a revised edition of the review was published in *Turf Tales Magazine*, Vol. 5 No. 3 (Summer 1998).

3. There have been numerous studies employing spring-applied treatments to hasten the bermudagrass transition. Unfortunately, the majority of the findings from these studies are not consistent. The treatments that have been tested include: core cultivation; vertical mowing; topdressing; scalping; vertical mowing and scalping; applications of nitrogen; applications of herbicides; and applications of plant growth regulators. No doubt, successful and consistent adoption of spring-applied treatments to hasten the bermudagrass transition will require timing based on soil and air temperatures.

4. Genetic variation for spring/summer persistence among overseed turfgrass has been reported. It is probable that there is genetic variation among cultivars of *poa trivialis.*

Recently, there has been a trend in the Coachella Valley towards a less severe fall renovation and overseeding of bermudagrass putting greens. The expectation is that these practices will result in a more rapid spring transition. Techniques being used to reduce the severity of fall renovation and overseeding include: applying Primo plant growth regulator to reduce bermudagrass growth in the fall; using higher scalping rates and therefore leaving more green stubble; not applying diquat on putting greens; and withholding irrigation for a shorter duration of time.

Due to the current interest of reducing the severity of fall renovation and overseeding to hasten the spring transition, a two-year study was developed to test treatments related to fall renovation and overseeding that would result in the fastest bermudagrass green coverage during the following spring and summer season.

OBJECTIVE

To test factors related to fall renovation and overseeding that would result in the fastest bermudagrass green coverage during the following spring and summer season.

HYPOTHESIS

The less severe the bermudagrass renovation in the fall, the more rapid the bermudagrass green coverage should be in the following spring and summer season.

Research Site

Location: Desert Horizons Country Club, Indian Wells, CA

Cultivar: Tifgreen bermudagrass (nursery plot)

Establishment: July 1989 (from stolons)

Root zone: Six-inch imported sand placed over native soil (imported sand was a topdressing mixture that was within USGA specifications). No drain tile was installed.

Soil analyses (0- to 4-inch depth, taken on 7-22-98):

Sand:	88%	EC_e:	0.78 $dS \cdot m^{-1}$ (500 TDS)
Silt:	11%	CEC:	4.5 meq/100g
Clay:	1%	SAR:	1.5
OM:	0.56%	ESP:	1%
pH:	7.7		

Treatment Factors, Associated with Fall Renovation, that were Tested for Their Effect on Bermudagrass Green Coverage During the Following Spring/Summer Season

Treatment factor	Treatment application date	
	1996-97	*1997-98*
1. Chemical application	Sep. 27	Sep. 22
2. Scalping level	Oct. 04	Sep. 29
3. Seed rate	Oct. 12	Oct. 10

Chemical Treatments

Applied to 6 x 10 ft subplots[†]:

1. Check (no chemical applied)
2. Reward (1 qt/acre)
3. Primo 1 EC (0.75 oz/1000 ft^2)
4. Primo 1 EC (0.25 oz/1000 ft^2)

[†] Finish spray volume = 2.0 gallons/1000 ft^2.

Scalping Level Treatments

Applied to 10 x 24 ft main plots:

1. "Stubble" (41% average bermudagrass green coverage on day of scalping in 1997).
   - Verticut 3 passes, triplex, 0.125 inch bench ht.
   - Sweep
   - Mow, triplex, 0.110 inch bench ht.
   - Verticut, triplex 0.125 inch bench ht.
   - Sweep

2. "Dirt" (2% average bermudagrass green coverage on day of scalping in 1997).
   - Verticut 3 passes, triplex, 0.125 inch bench ht.
   - Sweep
   - Mow, triplex, 0.110 inch bench ht.
   - Verticut, triplex 0.125 inch bench ht.
   - Sweep
   - Mow, walk-behind, 0.100 inch bench ht.
   - Sweep
   - Mow, walk-behind, 0.100 inch bench ht.

Seed Rate Treatments

Applied to 5 x 6 ft sub-subplots:

1. HIGH SEED RATE

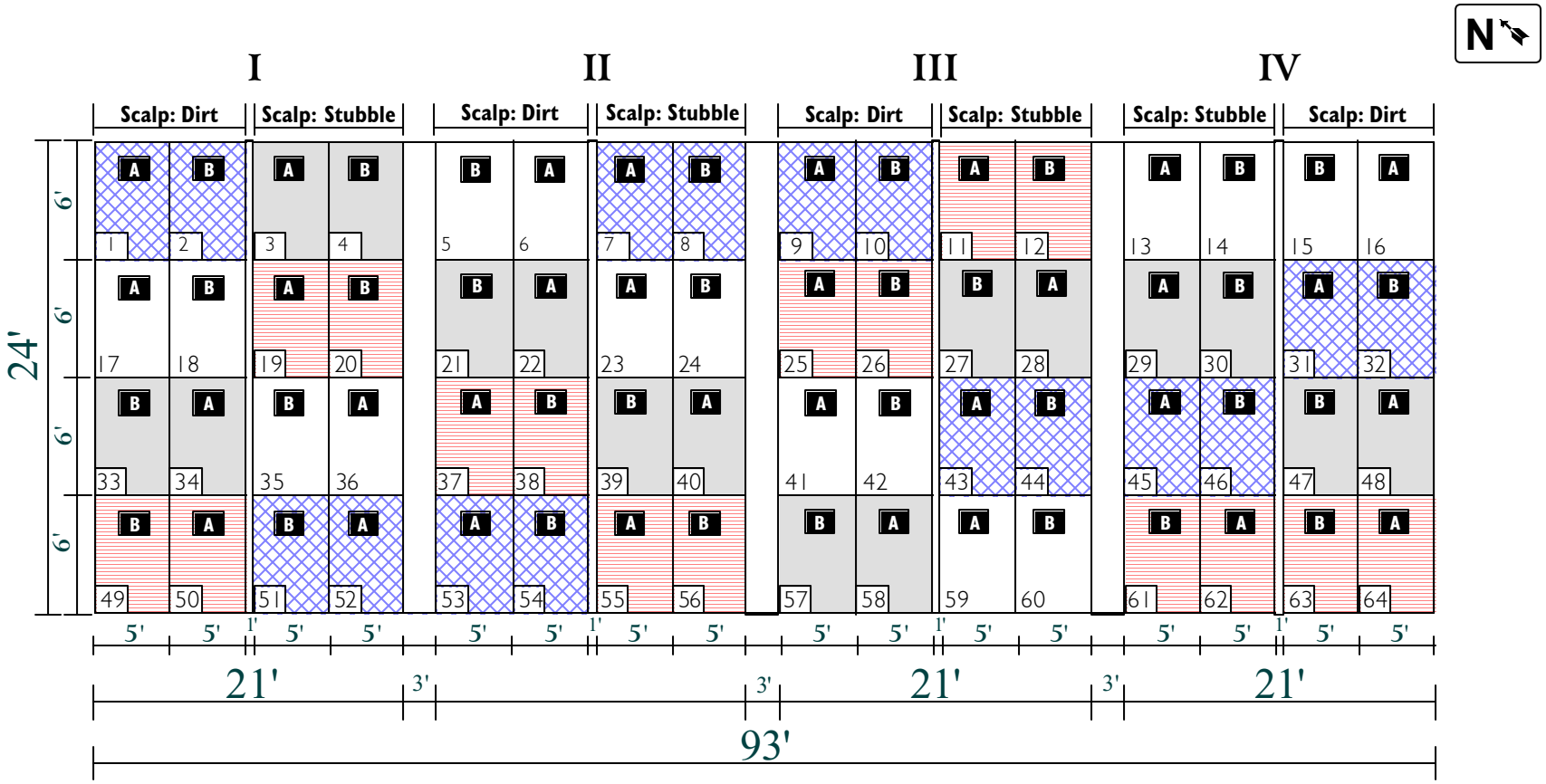
Year	Cultivar / species	Actual seed rate	Pure Live Seed (PLS) rate
1996-97	Seville perennial ryegrass	40.0	35.8
	Sabre *poa trivialis*	10.0	9.4
1997-98	Seville perennial ryegrass	40.0	35.8
	Sabre *poa trivialis*	12.6	9.4

2. LOW SEED RATE

Year	Cultivar / species	Actual seed rate	Pure Live Seed (PLS) rate
1996-97	Seville perennial ryegrass	25.0	22.3
	Sabre *poa trivialis*	10.0	9.4
1997-98	Seville perennial ryegrass	25.0	22.3
	Sabre *poa trivialis*	12.6	9.4

Note: Plots topdressed before and after seeding to a depth of approx. $^{3}/_{32}$ inch.

Research plot plan for the improvement of the spring transition of overseeded bermudagrass putting greens in the Coachella Valley at Desert Horizons Country Club, Indian Wells, CA.



Scalping level treatments (24 ft x 10 ft main plots)
• Dirt • Stubble

Chemical treatments (6 ft x 10 ft subplots)	
Reward	Primo 0.75
Primo 0.25	Check

Seed rate treatments (6 ft x 5 ft sub-subplots)
A: (35.8 lb PLS perennial ryegrass + 9.4 lb PLS *Poa trivialis*)/1000 ft²
B: (22.3 lb PLS perennial ryegrass + 9.4 PLS lb *Poa trivialis*)/1000 ft²

Plot Management Protocol

Mowing:	Daily mowing with walk-behind greens mower set at heights ranging from 0.312 to 0.085 inches, and usually set at about 0.115 inches (less than $^1/_8$ inch).
Fertilization:	0.3 lb N/1000 ft² per 3 weeks, using Microgreen 15-5-8.
Irrigation:	Irrigated to avoid drought stress and overwatering; irrigation source was well water.
Pesticides:	Pesticides were applied as needed (included Subdue 2G, Merit 75WP, and Dursban 50W).
Traffic:	Traffic was applied with a specially-constructed traffic simulator. The amount of traffic was visually estimated to be similar to the amount of foot traffic on the putting greens located at the GC. Normally, traffic was applied at a rate of 1 pass/day, 3 days/week.

Measurements

1. *Percent Bermudagrass Green Coverage:*
Ratings taken with two, 4 x 4 inch, subsamples from representative portions of each sub-subplot. Percent of openness within the subsample was also noted as necessary. Ratings taken every 3 weeks.

2. *Putting Green Visual Quality for an Overseeded Bermudagrass:*
Ratings taken on a 1-9 scale, with 9 = best, 5 = minimally acceptable, and 1 = worst putting green quality. Ratings taken every 6 to 10 weeks.

3. *Air Temperatures:*
On-site air temperatures were taken hourly with a data micrologger protected from the direct light of the sun.

4. *Soil Temperatures:*
On-site soil temperatures were taken hourly with a data micrologger sensor installed 2 inches below the soil surface of the research plot.

5. *NOAA/National Weather Service Air Temperatures:*
Historical 30-year (1961-1990) averages air temperatures were obtained from the National Weather Service in Indio, CA.

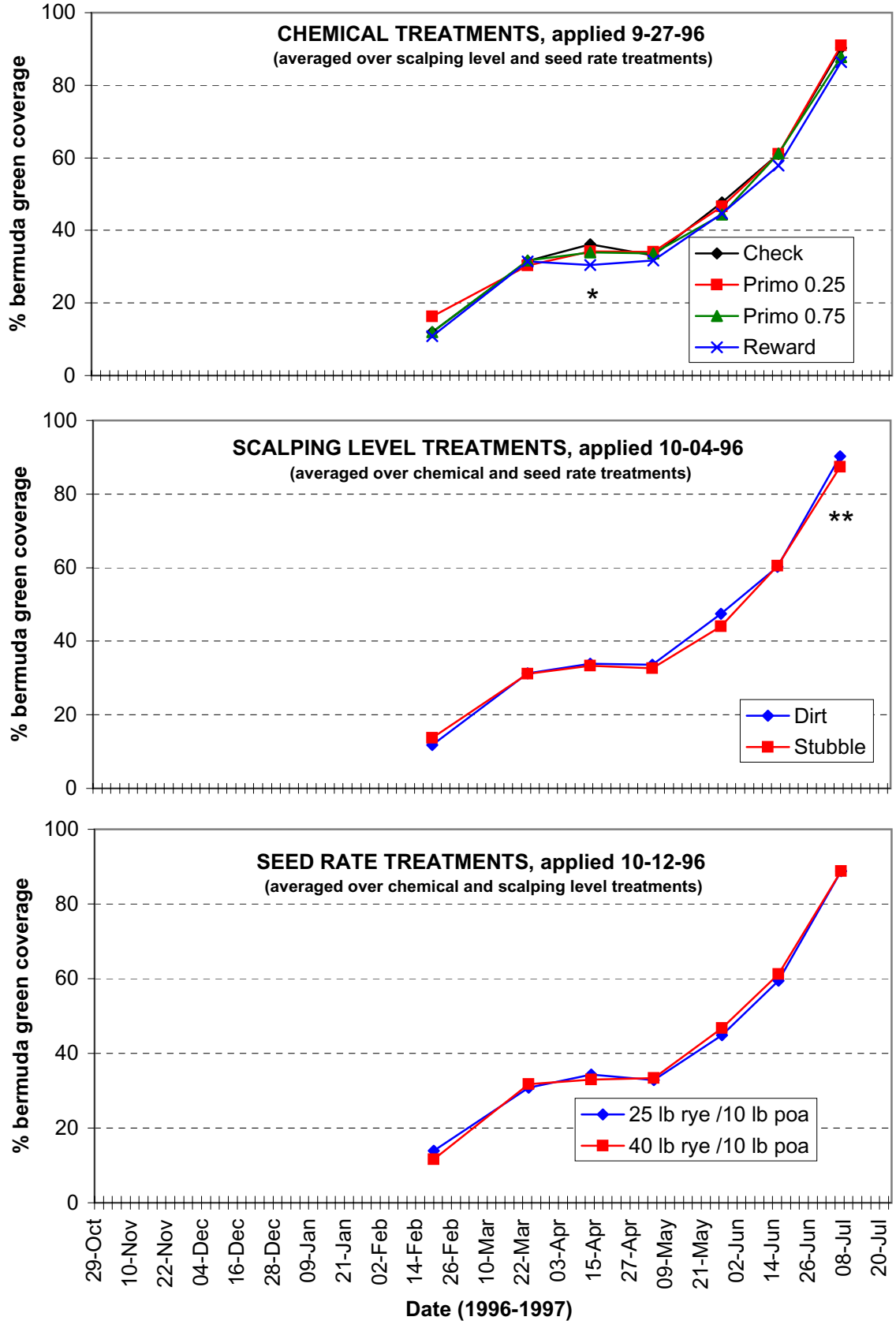
Calendar of Major Activities

DATE	ACTIVITY
	SEASON 1
Sep. 27, 1996	Chemical treatments applied.
Oct. 4, 1996	Scalping treatments applied.
Oct. 12, 1996	Seed treatments applied.
Oct. 20, 1996	Initial mowing: 0.312 inches ($^5/_{16}$ inches).
Oct. 23, 1996	Initial fertilization. Fertility regime set to 0.3 lb N/1000 ft^2 with Microgreen 15-5-8 every three weeks.
Nov. 8, 1996	*Desert Horizons Country Club opens its course for play* *Mowing height: 0.141 inches.*
Dec. 20, 1996	Initial traffic applied. Traffic regime set to 1 pass/day, 3 days/week.
Feb. 20, 1997	Initial rating for percent bermudagrass green coverage. Ratings subsequently taken every three weeks. Mowing height: 0.110 inches.
July 7, 1997	Traffic regime halted. Final application of Microgreen fertilizer.
July 29, 1997	Final ratings for percent bermudagrass green coverage.
	SEASON 2
Sep. 22, 1997	Chemical treatments applied.
Sep. 29, 1997	Scalping treatments applied.
Oct. 10, 1997	Seed treatments applied.
Oct. 18, 1997	Initial mowing: 0.312 inches ($^5/_{16}$ inches).
Oct. 24, 1997	Initial fertilization. Fertility regime set to 0.3 lb N/1000 ft^2 with Microgreen 15-5-8 every three weeks.
Nov. 1, 1997	*Desert Horizons Country Club opens its course for play.* *Mowing height: 0.140 inches.*
Nov. 11, 1997	Initial rating for percent bermudagrass green coverage. Ratings subsequently taken every three weeks. Mowing height: 0.125 inches.
Nov. 17, 1997	Initial traffic applied. Traffic regime set to 1 pass/day, 3 days/week.
Dec. 2, 1997	Initial rating for putting green visual quality. Ratings subsequently taken every 6 to 10 weeks.
June/July 1998	Traffic regime halted.
July 1, 1998	Final rating for putting green visual quality. Final application of Microgreen fertilizer.
July 22, 1998	Final ratings for percent bermudagrass green coverage.

RESULTS:

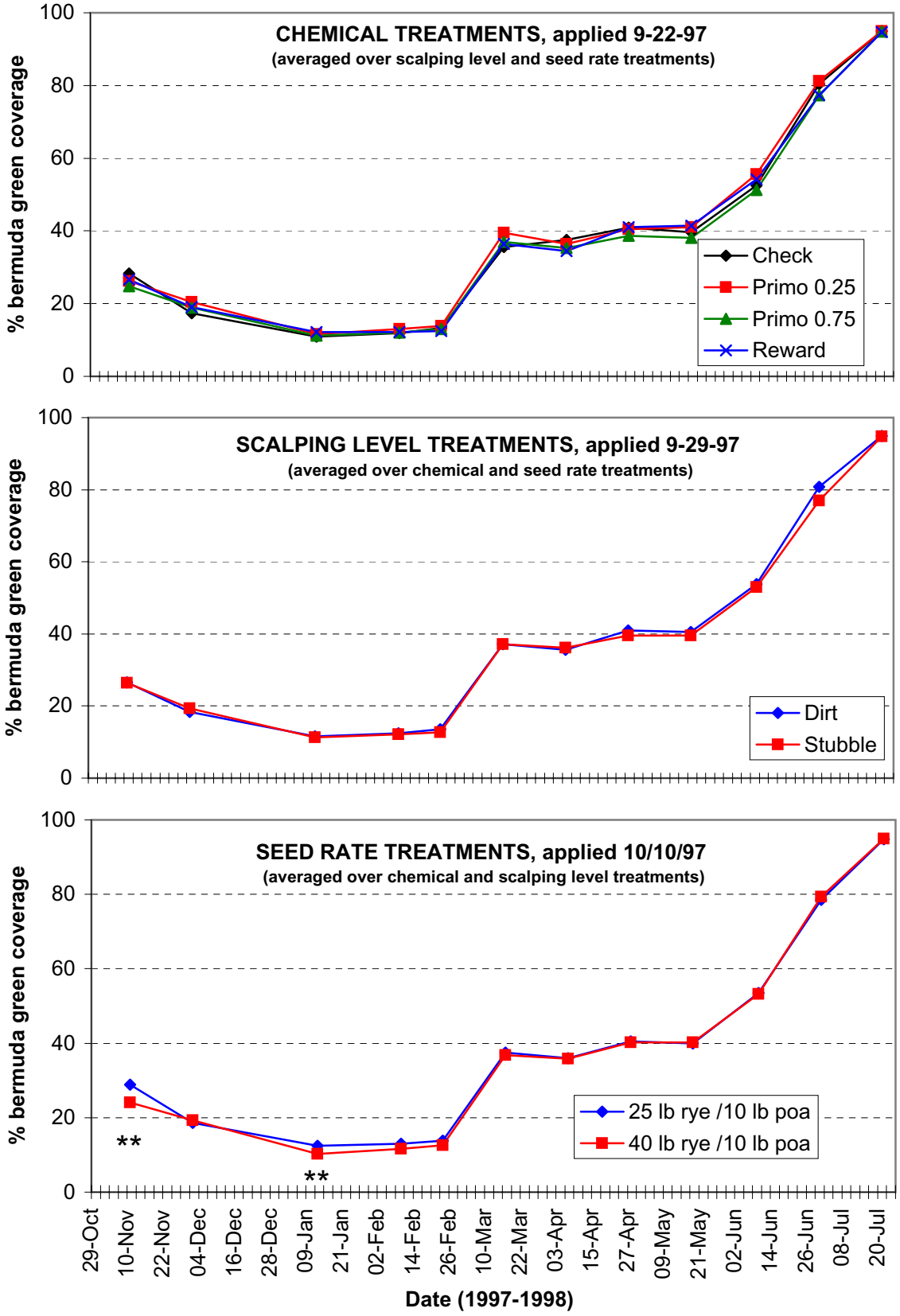
Improvement of the Spring Transition of Overseeded Bermudagrass Putting Greens in the Coachella Valley

Percent bermudagrass green coverage from 2-20-97 to 7-07-97 for four chemical treatments, two scalping level treatments, and two seed rate treatments that were applied to a Tifgreen bermudagrass nursery during fall 1996.



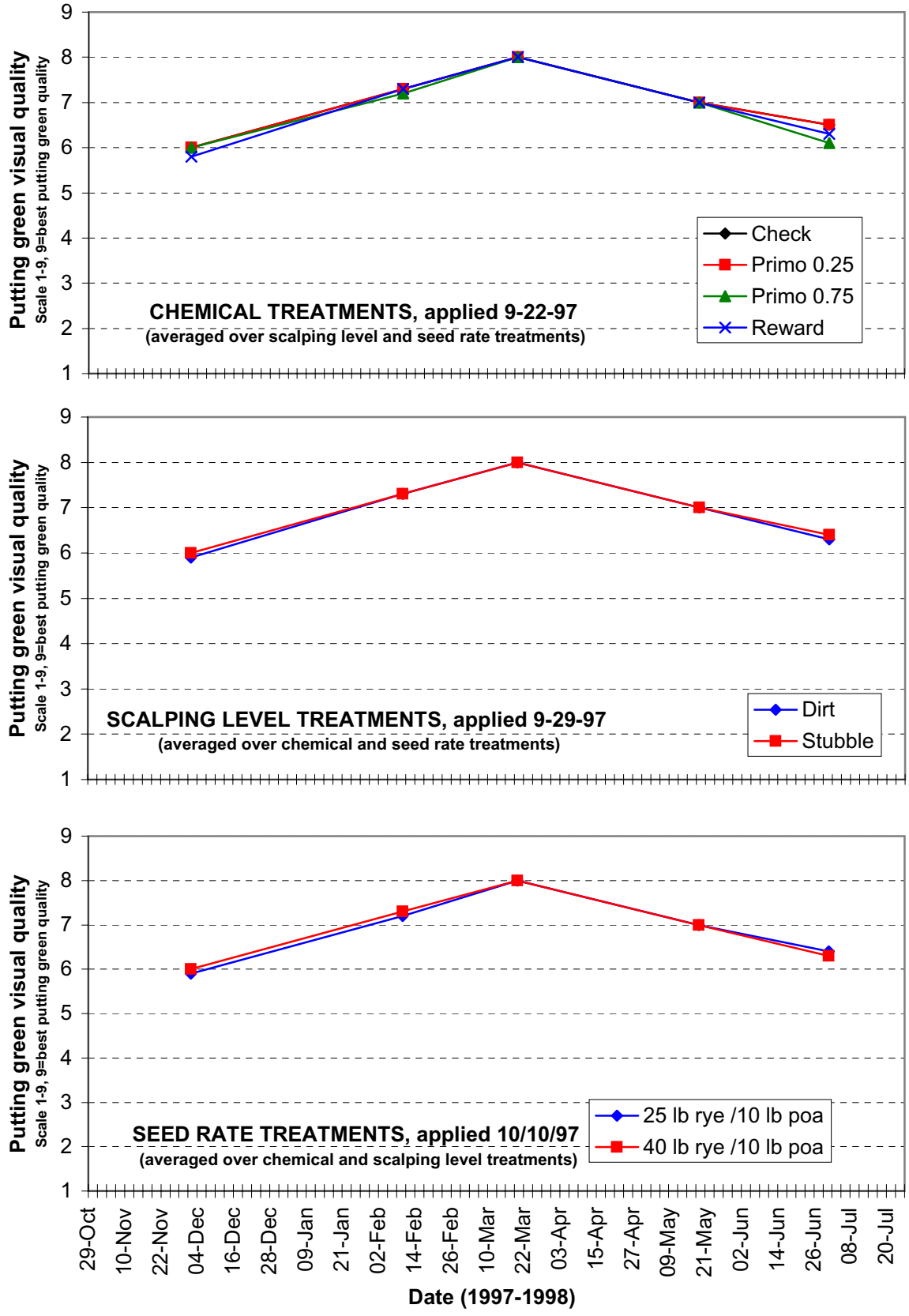
*, **, *** Significant at $P \leq 0.05$, 0.01, and 0.001, respectively.

Percent bermudagrass green coverage from 11-11-97 to 7-22-98 for four chemical treatments, two scalping level treatments, and two seed rate treatments that were applied to a Tifgreen bermudagrass nursery during fall 1997.



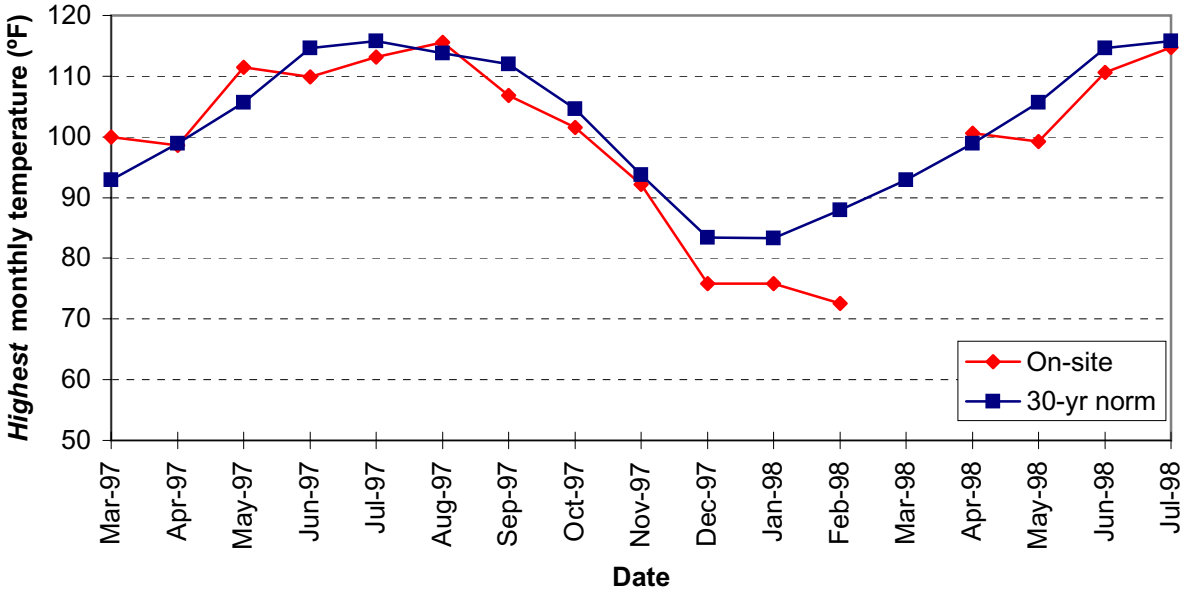
*, **, *** Significant at $P \leq 0.05$, 0.01, and 0.001, respectively.

Putting green visual quality from 12-02-97 to 7-01-98 for four chemical treatments, two scalping level treatments, and two seed rate treatments that were applied to a Tifgreen bermudagrass nursery during fall 1997.

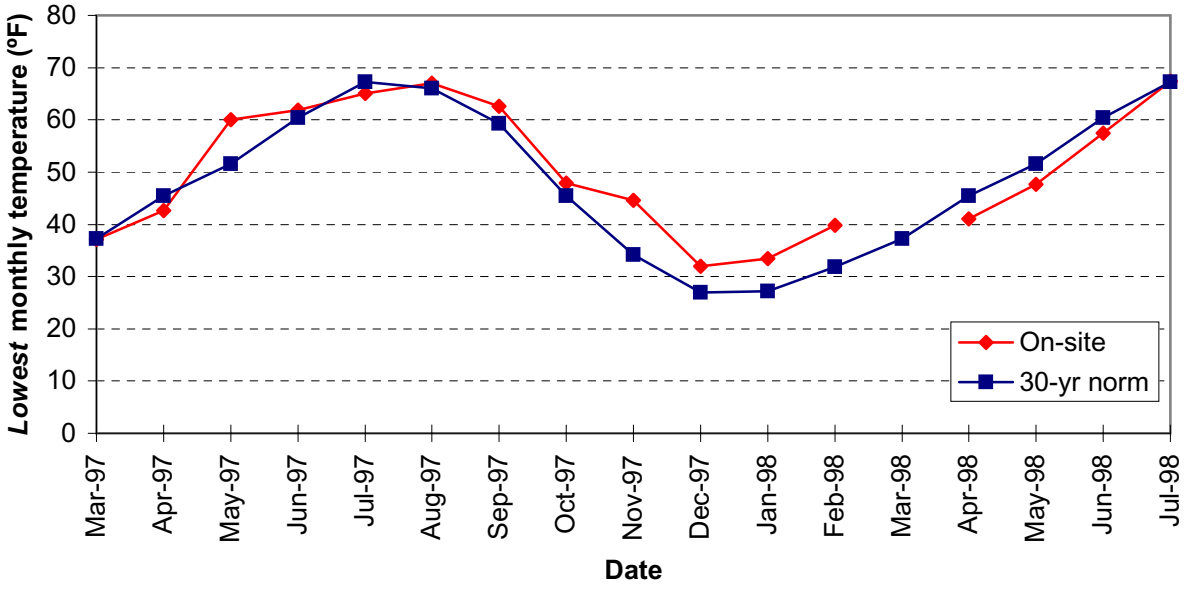


*, **, *** Significant at $P \leq 0.05$, 0.01, and 0.001, respectively.

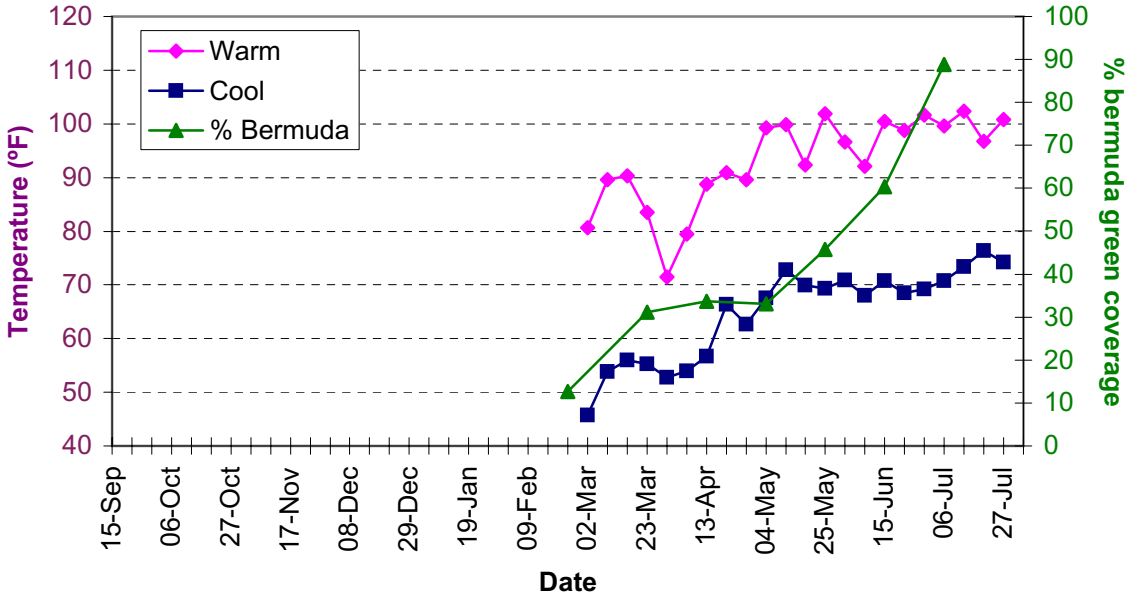
Highest monthly air temperatures on-site at Desert Horizons Country Club*vs.* 30-year average highest monthly temperatures in Indio, CA



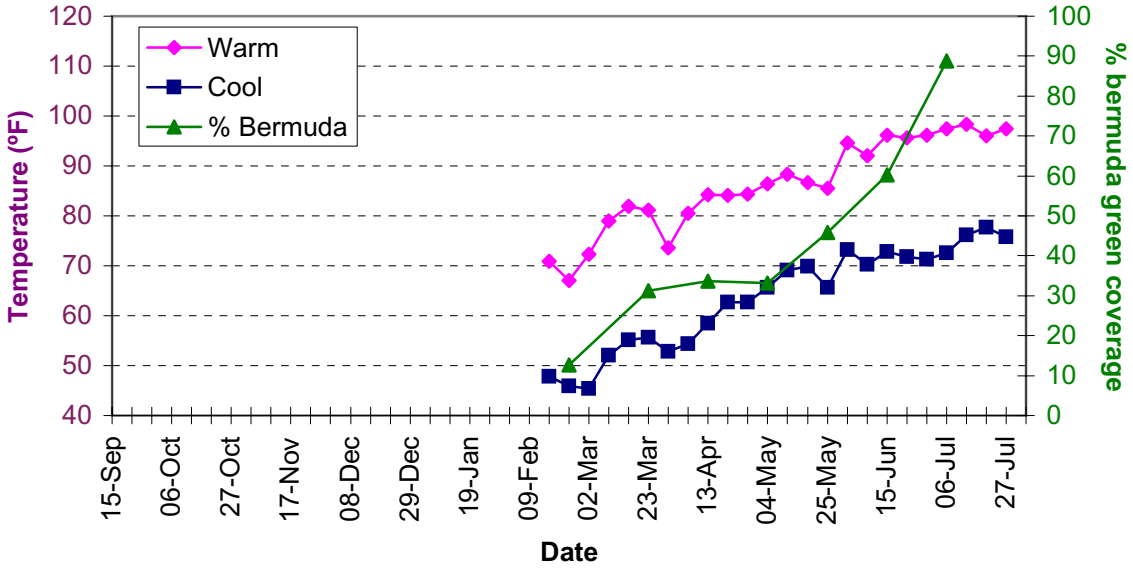
Lowest monthly air temperatures on-site at Desert Horizons Country Club C*vs.* 30-year lowest highest monthly temperatures in Indio, CA



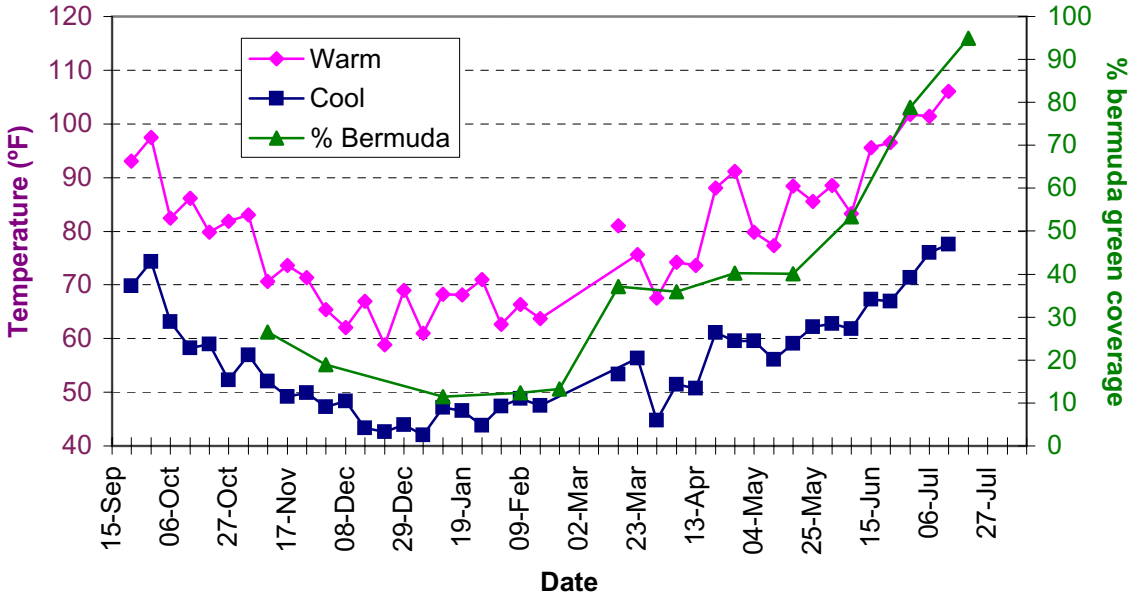
Weekly mean warm (12 noon to 4 p.m.) and cool (2 a.m. to 6 a.m.) **air temperatures** on-site at Desert Horizons Country Club, Indian Wells, CA and average percent bermudagrass green coverage of all treatments from 2/20/97 to 8/02/97.



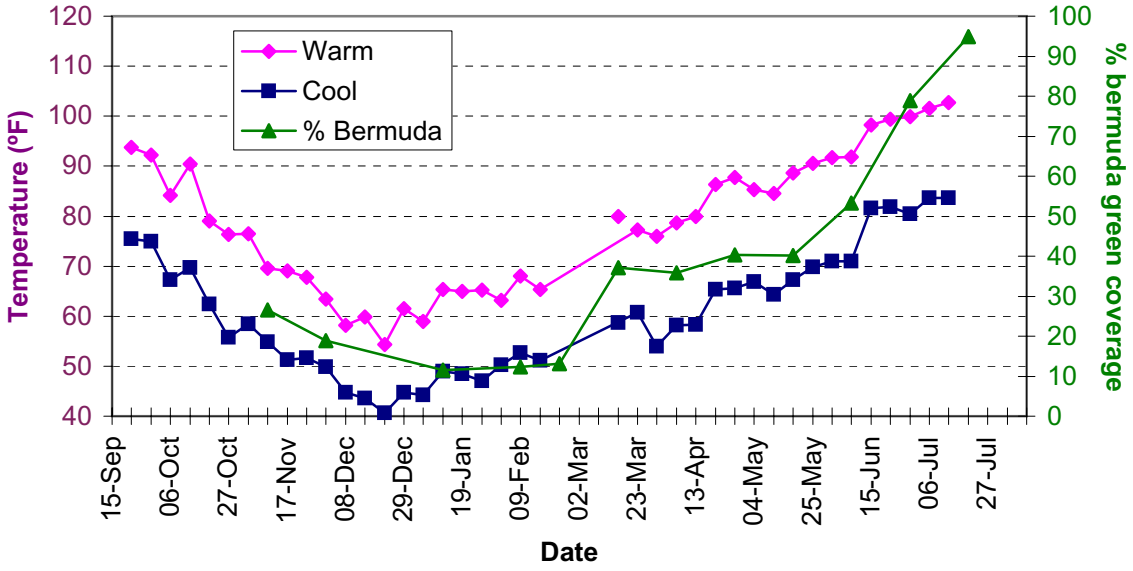
Weekly mean warm (12 noon to 4 p.m.) and cool (2 a.m. to 6 a.m.) **soil temperatures** on-site (2-inch depth) at Desert Horizons Country Club, Indian Wells, CA and average percent bermudagrass green coverage of all treatments from 02/16/97 to 08/02/97.



Weekly mean warm (12 noon to 4 p.m.) and cool (2 a.m. to 6 a.m.) **air temperatures** on-site at Desert Horizons Country Club, Indian Wells, CA and average percent bermudagrass green coverage of all treatments from 9/22/97 to 7/22/98.



Weekly mean warm (12 noon to 4 p.m.) and cool (2 a.m. to 6 a.m.) **soil temperatures** on-site (2-inch depth) at Desert Horizons Country Club, Indian Wells, CA and average percent bermudagrass green coverage of all treatments from 9/22/97 to 7/22/98.



Air and Soil Temperatures at Different Phases of Bermudagrass Green-Up on Overseeded Putting Greens

	Season One		Season Two	
INITIAL GREEN-UP	*Start*	*End*	*Start*	*End*
Approximate dates:	2/16/97	3/29/97	2/22/98	3/21/98
% bermudagrass green coverage:	12.7	31.2	13.2	37.1
	Warm	*Cool*	*Warm*	*Cool*
Average air temperature (ºF)[z]:	86.4	53.2	—	—
Average soil temperature (ºF):	75.4	50.3	—	—
LAG GREEN-UP	*Start*	*End*	*Start*	*End*
Approximate dates:	3/29/97	5/10/97	3/21/98	5/23/98
% bermudagrass green coverage:	33.7	33.1	35.9	40.1
	Warm	*Cool*	*Warm*	*Cool*
Average air temperature (ºF):	86.1	59.3	79.7	55.3
Average soil temperature (ºF):	82.0	58.9	89.4	68.4
BERMUDA TRANSITION	*Start*	*End*	*Start*	*End*
Approximate dates:	5/10/97	7/12/97	5/23/98	7/25/98
% bermudagrass green coverage:	45.8	88.8	53.3	94.9
	Warm	*Cool*	*Warm*	*Cool*
Average air temperature (ºF):	98.3	69.8	94.2	68.2
Average soil temperature (ºF):	91.9	70.2	96.8	74.2

[z] Temperatures are the average of the daily warm (12 noon to 4 p.m.) or cool (2 a.m. to 6 a.m.) temperatures for the time period specified.

Summary: Fall-Applied Treatment Effects on the Spring Transition of Bermudagrass Putting Greens

1. During two consecutive years, fall-applied treatments associated with the renovation and overseeding of a Tifgreen putting green nursery did not affect the amount of bermudagrass green coverage in the following spring and summer.

2. During the second year, these treatments also did not affect the visual turfgrass quality for an overseeed bermudagrass putting green.

3. One probable explanation why the treatments were not significant is that fall and winter temperatures were relatively mild, resulting in little if any freezing plant stress to act as a synergist with plant stress related to renovation and overseeding treatments. Actually, fall and winters are relatively mild in the Coachella Valley.

4. Under the conditions of this study, *poa trivialis*, was the dominant component of the mature overseeding and it persisted for a longer time during the summer than perennial ryegrass.

Summary: The Influence of Air and Soil Temperatures on the Spring Transition of a Bermudagrass Putting Green

Based on the two seasons of data from this study, the following observations can be made:

1. Initial bermudagrass green-up occurred in mid to late February when warm (12 noon to 4 p.m.) air temperatures were in the 80's (ºF).

2. Bermudagrass transition initiated during mid to late May and completed mid to late July. During this period, cool (2 a.m. to 6 a.m.) soil temperatures were in the 70ºF range.

Summary: Can Information Concerning the Spring Transition of Bermudagrass Putting Greens Also Apply to the Spring Transition of Bermudagrass Fairways?

1. It would not be unexpected to find that the growth response of common bermudagrass to air and soil temperatures during the spring and summer is similar to the growth response of hybrid bermudagrass.

2. However, it would not be surprising to learn that the spring transition of a common bermudagrass fairway, overseeded with perennial ryegrass, has a different rate than a hybrid bermudagrass putting green basically overseeded with *poa trivialis*.