

COOL-SEASON AND WARM-SEASON GRASSES OVERVIEW

By Kevin Morris

Editor's Note: Each year, Kevin Morris provides an update on the data collected on commercial varieties and experimental turfgrasses entered into the National Turfgrass Evaluation Program (NTEP). This information helps turfgrass producers choose the varieties that will best perform in their particular growing area and management programs. TPI and TurfNews wish to thank Mr. Morris for the significant amount of time and effort in providing this valuable overview.

At any one time, the National Turfgrass Evaluation Program (NTEP) is evaluating over 600 cultivars and experimental selections in nationwide tests. Data collected and summarized from these trials can be obtained directly from NTEP or from our website (www.ntep.org). Our data is also published on a CD, in exactly the same format as the NTEP website. The CD is read like any informational CD on your computer. The advantages of the CD include its portability, its search features and taking up less space on your bookshelf than hard copy reports. We still have however, printed copies of reports available on request.

NTEP Data Presentation

NTEP information includes data collected on many descriptive and performance characteristics. Descriptive characteristics describe the entries tested, i.e. genetic color, leaf texture and density characterize a grass' appearance. Performance characteristics document the response to various stresses, such as disease, cold and drought. For instance, the percent ground cover rating, although not necessarily affected by a single stress, reflects the grass' ability to withstand and/or recover from a particular stress or a series of stresses.

The most widely used data in NTEP reports are the turfgrass quality (TQ) ratings. Quality ratings are collected monthly during the growing season using a 1-9 scale with 9=ideal turf. Turfgrass quality ratings are collected by evaluators considering all the factors that make good turf, i.e. good green color, density, adequate ground cover, freedom from disease and other stresses, etc. Quality ratings show a lot about the grasses, that is why they are so important.

NTEP turfgrass quality tables focus on grouping by region or management level. In addition, we have the data from each state available on our website and CD.



Cool-season drought shelter at College Park, MD, before initiating drought on USGA/NTEP Cool-Season Water Use Trial.

Hopefully, this makes the data more useful to growers within their geographical region or under their specific management level. *NTEP recommends that growers first review data collected in their state or region and also under the management regime most suited to their needs.* To find data for a specific state, go to www.ntep.org/states/states.htm.

NTEP Unveils Improved Data Reporting Procedure

NTEP is committed to improving its data collection, analysis and reporting. To that end, NTEP spent ten years researching new statistical methods and is now implementing a new reporting procedure, the 'Location Performance Index' or 'LPI', on its newest trials. The LPI is based on 'AMMI', a more complete, accurate statistical analysis program for predicting cultivar performance across many locations.

The LPI is only used on turfgrass quality data but in reading the turfgrass quality tables, you will notice that locations may not be grouped by any apparent geographical orientation. For instance, in the 2012 data from our new Kentucky bluegrass trial, 'LPI Group 1' included Amherst, MA, W. Lafayette, IN, Urbana, IL, St. Paul, MN, Manhattan, KS and Pullman, WA. It seems that these locations have nothing in common, geographically or climatically. However, what they do have in common is a very important similar 'interaction pattern', i.e. the varieties performed in a similar manner, relative to each other, at each of these locations in that year. For that reason and most appropriately, the LPI groups them together for analysis. And that 'interaction pattern' can, and very often will vary from year to year. Therefore, investigate the LPI Group data containing locations that are closest to you, or your market.

The LPI is used on new trials as they are initiated. Go to <http://www.ntep.org/LPI%20reporting%20Q&A%205-9-13.pdf> to read more about the LPI and the reasons for utilizing this new procedure.

Focus On Specific Traits

NTEP is designing its trial programs so that more data on specific traits are collected. For instance, *standard* trial locations, conducted at university sites using prescribed management schemes, collect traditional data, such as turfgrass quality, color, density, any diseases present, etc. NTEP also sponsors *ancillary* trial locations that collect data on specific traits, such as shade tolerance, traffic tolerance and sod strength. These ancillary trials must often be conducted in unique locations (i.e. under shade trees) or using specialized equipment (i.e. a traffic simulator). Because ancillary trials are applying unique stress to the entries, the data from these locations are often summarized and reported in separate tables.

NTEP plans on conducting more of these *ancillary* trials in the future and is in fact, co-sponsoring



Rust disease on Kentucky bluegrass.

with USGA, an entire trial just to evaluate cool-season and warm-season grasses for drought resistance and water use. The cool-season water use trial was established in fall 2016, with ten locations initiating drought evaluations in summer 2017 or 2018. The warm-season version of this trial is scheduled for establishment in summer 2018, so look for data from both versions of this trial within the next few years. In addition, NTEP sponsored a low input trial for cool-season grasses and mixtures in fall 2015, and is planning a warm-season low input trial for summer 2018. It is our hope that these types of data will provide much needed information to consumers on these important traits.

Update On Cultivars

The following is an overview of the latest information on commercially available and experimental cultivars.

COOL-SEASON

Kentucky Bluegrass

2016 was the fifth and final year of data collected from our latest Kentucky bluegrass trial, established in fall 2011. A final report of data collected from 2012-2016 was completed and released by NTEP in fall 2017. A new trial of Kentucky bluegrass was established in 2017, therefore, this report focuses on the recently completed 2011 trial and its final report.

Turfgrass quality ratings provide a view of overall entry performance, showing why they are so important to consider. With this five year summary, we look at locations in the different regions and identify top performers. In the North Central region, several entries finished in the top statistical group, including **Blue Note**, **Bluebank**, **J-1770**, **A05-360** and **A06-46**. These grasses plus **Barserati**, **Midnight**, **J-1853** and **SR 2150** (among others) were top entries as well at two Northeast locations (Adelphia, NJ, and North Brunswick, NJ).

Transition Zone locations often provide the most environmental stress on Kentucky bluegrass entries. Over the testing period, the five trial locations certainly delivered on this promise. **SRX 466, Skye, Barvette HGT, Barserati, A06-46, and Keeneland** had the highest quality ratings, followed by **Blue Note, Pick 033** and **Bluebank**.

Top performers at the Guelph, Ontario, Canada site (managed using 'organic' methods) from 2012-2016 included some older cultivars such as **Midnight** and **Award**, new experimentals like **SRX 466** and **J-1770**, and some new commercial cultivars (**Barvette HGT** and **Barserati**). Data from our two western U.S. locations (Puyallup, WA, and Logan, UT) showed excellent performance from **Pick 4340, Keeneland** and **A00-2882** at both sites, with **J-1136, A01-1106, Mazama** and **A06-46** also performing well over the five years.

Data analyzed by management schedule revealed some interesting differences among top performers under each schedule. Schedule "A" replicated a good quality home lawn in most regions (1.5-2.5" mowing height, 3-4 lbs./N/1000 sq. ft., irrigation to prevent stress or dormancy) while Schedule "B" approximated a lower input turf area (3+ mowing height, 0-2 lbs./N/1000 sq. ft., no irrigation after establishment). Entries that performed very well in both Schedule "A" and "B" include **Blue Note, A06-46, Bluebank, J-1770** and **Keeneland**.

The 2011 Kentucky bluegrass trial consists of several ancillary locations testing for tolerance to various stresses. For example, since 2012, shade tolerance has been evaluated at Carbondale, IL, with five years of data showing **Keeneland, Mazama, BAR 8PP 504, Barvette HGT, PST-K9-99, Barsahara, Burl 3-51** and **Kenblue** with the best shade tolerance.

Traffic tolerance was evaluated at Amherst, MA, E. Lansing, MI, North Brunswick, NJ, Madison, WI, and Knoxville, TN, for at least three years. At Amherst, **Rubix, Blue Note, A06-47** and **SRX 4338** top the quality ratings, while **Rubix** had the highest wear tolerance over three ratings. In Knoxville, **Barvette HGT, BAR VV 118352** and **Bluebank** had the highest quality ratings over the four year test period. **Barvette HGT, Rubix** and **Aramintha** were the most consistent entries over the four years of data collection at North Brunswick, NJ. The results from Madison revealed **Barvette HGT, A05-360** and **Zinger** in the top spots, followed by nine entries. And in East Lansing, no statistical differences were noted among entries.

Data on various diseases such as summer patch (*Magnaporthe poae*), dollar spot (*Sclerotinia homeocarpa*) and stem rust (*Puccinia graminis*) were reported over the five years of this trial. Data on summer patch, one of the most devastating diseases on Kentucky bluegrass, was collected at several locations and reported during several years of the trial. Summer patch damage at Raleigh, NC, seemed to be the most consistent with **Barvette HGT, Barserati,**

J-1770, Pick 033 and **SRX 466** showing the least disease. Summer patch ratings collected at seven additional locations showed less consistency, however, **Barvette HGT, SRX 466** and **Pick 033** had some of the best tolerance ratings, along with **Blue Note** and **Bluebank**. The differences in tolerance among these locations may indicate variation in the disease-causing organisms.

Dollar spot ratings were collected at five locations but only the entries in the bottom 10 percent showed significant susceptibility to the disease. Stem rust ratings collected at several locations showed **Barvette HGT, Bolt, Pick TD8, PST-T10-18, A06-46, Burl 06-11** and **RAD-849** with the most consistently high tolerance ratings.

Other ratings of interest during the test period include data such as thatch measurements and drought tolerance. Thatch accumulation was measured at Madison, WI, with **Barvette HGT, J-1770, Nu Chicago, Bolt** and **Barserati** finishing with the least thatch. And drought tolerance ratings collected in W. Lafayette, IN, had **A05-TB-382, RAD-849, A06-26**, among nine other entries, with the best tolerance of drought dormancy.

Tall Fescue

This report utilizes the fifth and final of this trial, planted in 2012. The trial contains 116 entries, of which many are still experimental. Year one data typically reflects establishment rate, year two data usually reflects broader cultivar performance, while years three through five allow us to determine if trends seen in year two are still viable. A final summary brings all the years together and is the best measure of long-term performance.

Turfgrass quality ratings in 2017 again varied by region and even by management regime. Schedule "A" maintenance, which approximates a high quality home lawn in many regions (1.5-3" mowing height, 3-4 lbs./N/1000 sq. ft., irrigation to prevent stress), showed the most entry separation with only nine entries in the top statistical grouping, led by 4th **Millennium SRP** and **Regenerate**. **MET 1** had the highest turf quality rating under Schedule "B" (2.5-3.5" mowing height, 1-2 lbs./N/1000 sq. ft., irrigation to prevent dormancy). Entries that finished in the top statistical group under both management regimes include **4th Millennium SRP, Regenerate, Raptor II, MET 1, F711, Amity** and **Thor**.

When comparing regional data analyses, the largest separation in performance was noted in the six transition zone locations, such as College Park, MD, Columbia, MO, Lexington, KY, and Raleigh, NC. **Traverse 2 SRP, Raptor III, MET 1, and 4th Millennium SRP** among others performed very well at this regional analysis in 2017, often besting the top performers from the previous trial, **Faith** and **Catalyst**.

Data from the Northeast was collected at Storrs, CT, and two New Jersey locations. Entries like **Regenerate, Reflection, 4th Millennium SRP** and **MET 1** again generally performed well in the Northeast where

brown patch (*Rhizoctonia solani*) was active.

Similar to 2015 and 2016, locations in the South and Southeast generally did not note large entry differences with anywhere from 50-75% of all entries performing statistically similar to the top turfgrass quality scorer in 2017. Data from our Southwest site (Riverside, CA) showed good entry separation, like in 2016. **4th Millennium SRP, Screamer LS, Maestro, PSG-P01 and Technique**, top performers in 2016, along with **IS-TF 311** and **Regenerate** were some of the highest rated entries in 2017 at the Riverside location.

In the Midwest, some significance was noted at four locations: Ames, IA, West Lafayette, IN, Urbana, IL, and Mead, NE. A few entries that performed well at all four locations include **Regenerate, Raptor III, W41 and Reflection**.

Tolerance to stresses such as traffic, shade, drought and brown patch are being evaluated throughout the testing period. Grey leaf spot (*Magnaporthe oryzae*) is also being noticed more on tall fescue, and for the first time, it was evaluated on this trial. Data collected at our Raleigh, NC, location, although interesting and with good separation among the scores, was not statistically significant in 2017.

Intensive traffic was applied on the tall fescue trials at North Brunswick, NJ, and Knoxville, TN, in 2017. As with the previous years and trial locations, year five data showed very little statistical differences among entries. Data from evaluations conducted in shade at Carbondale, IL, demonstrated the greatest differences among entries than in any year of the trial. **Rowdy, Titanium 2LS, Annihilator, ATF 1612, GTO and Michelangelo** were the only entries in the top turf quality statistical group under the shade stress in Carbondale.

Data from Logan, UT, on a trial where irrigation is reduced, showed moderate statistical significances with separation of the top 50 percent of entries. **Fayette, IS-TF 272, Firewall and IS-TF 311** earned the highest overall quality scores at the Logan, UT, reduced irrigation trial site.

Brown patch is typically the most prevalent disease on tall fescue, but in 2017, only a few locations noted and rated the disease. At Wichita, KS, **Paramount, Leonardo and PPG-TF-169** had the highest tolerance ratings (5.7) but very little statistical significance was noted. The Adelphi, NJ, location rated brown patch also in 2017 with data ranging from 7.7 to 1.0 (scale is 1-9, 9=no disease). Entries with the highest brown patch rating at Adelphi include **Thor** (7.7), **Maestro** (7.3), and **Screamer LS** (7.3).

Perennial Ryegrass

Perennial ryegrasses are occasionally used in sod mixtures because of positive attributes such as fast germination, better establishment under low and high temperatures and traffic tolerance. A new trial of perennial ryegrass, established in 2016, consists of 114 entries, of which most are new experimentals. The first data from this trial (2017) is now available on our website.

Data from 2017 did not show large entry differences when averaged over LPI groups. Entries such as **PPG-PR 424, PPG-PR 331, PPG-PR 420, PPG-PR 421, Furlong, NP-2, and Silver Sport** finished in the top statistical group for turf quality in both LPI groups. When analyzed by geographic region, several entries, including **Furlong, PPG-PR 420, PL2 and PPG-PR 419** had turf quality ratings in the top statistical groupings for all regions.

Data was also analyzed by three management regimes. High, medium and low maintenance schedules (A, B and C) approximate a golf course fairway, athletic field and home lawn, respectively. Several of the same entries that performed well in the different geographic regions also performed well under all three maintenance regimes, including **NP-2, Furlong, PPG-PR 423, PPG-PR 424, PPG-PR 371, PPG-PR 420 and PPG-PR 331**. Other entries that finished in the top turf quality statistical group under all three regimes include **DLFPS-236/3554, Xcelerator and PL2**.

Drought tolerance was tested at Logan, UT, in 2017, alongside a standard irrigation trial regime. Statistical differences were not large among entries, but **DLFPS-236/3554, DLFPS-236/3542 and Savant** scored particularly well in both normal and drought irrigation trials. Other entries that performed well under the drought scenario include **PST-2CRP, BAR LP 6164, DLFPS-236/3547, LPB-SD-104 and Mensa**.



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Winter injury was noted at the St. Paul, MN, location in 2017 with tolerance ratings ranging from 7.7 – 2.3 (scale is 1-9, 9=no damage; LSD=2.7). Considering this is data from only one winter and one location, the range of ratings indicate potential separation among entries, with **LPB-SD-102**, **BAR LP 6164**, **DLFPS-236/3554**, and **Overdrive 5G** with the highest ratings.

Traffic tolerance was tested at three locations in 2017, with each site using different methodology and that led to varying results. An abrasive brushing technique used at Amherst, MA, showed good entry separation with **PPG-PR 424**, **DLFPS-236/3547** and **PPG-PR 331** topping the turf quality ratings. However, **ASP0118GL** and **DLFPS-236/3552** had the highest rating (7.0) for wear tolerance. Less entry separation was noted at Corvallis, OR, (using a cleated traffic simulator) but **DLFPS-236/3552**, along with **DLFPS-236/3541**, **LPB-SD-102** and **PPG-PR 343** finished in the top statistical group, among many other entries. The Blacksburg, VA, location showed great differences in turf quality and ground cover over time, however statistical differences among entries were small.

Salt tolerance evaluations were conducted in the greenhouse at Fort Collins, CO, in 2017. First year data did not reveal large statistical differences, but performance varied greatly among entries. Entries were tested at salt levels from 8 dS/m (decisiemens per meter) to 24 dS/m. Entries started to separate at 20 dS/m, but large differences were finally noted at 24 dS/m (sea water is approximately 55 dS/m), with only **Savant** and **DLFPS-236/354** maintaining 50 percent or greater quality of the control pots (no salt treatment).



Fine fescue entries under drought stress at College Park, MD.

A few diseases were rated during year one of the new perennial ryegrass trial and grey leaf spot is one of the most significant. Grey leaf spot can attack and kill perennial ryegrass in a relatively short period of time, making it one of the most destructive pathogens to attack this species. Adelphia, NJ, noted grey leaf spot infection and collected data that ranged from 1.0 – 9.0 (where 9=no disease). Entries scoring very high in this one grey leaf spot rating include **Karma**, **02BS1**, **DLFPS-236/3553**, **JR-197** and **NP-3**. More data must

be collected to see if this 2017 information is consistent across locations and years.

Fineleaf Fescues

The term “fineleaf fescue” includes several species. Strong creeping red fescue (*Festuca rubra* spp. *rubra*) and slender creeping red fescue (*Festuca rubra* var. *littoralis*) possess rhizomes and therefore add knitting ability to a sod mixture. Chewings fescue (*Festuca rubra* ssp. *fallax*) has a bunch-type growth habit and traditionally better disease resistance than the creeping red-types. Hard fescues (*Festuca brevipila*) are also bunch-type grasses but have generally better drought tolerance than Chewings or creeping types. Sheep fescue (*Festuca ovina* L. ssp. *hirtula*) is best suited for low maintenance sites because of its unique, swirly, growth habit from within the crown of the plant.

A new fineleaf fescue trial was established in 2014, with third year data from that trial now available. This new trial consists of 42 total entries, broken down into hard fescue (10), strong creeping red fescue (16), slender creeping red fescue (3), chewings fescue (12) and sheep fescue (1). The trial is planted at ten standard trial locations and eleven ancillary trial locations.

As in previous years, a good separation among entries was noted at most locations in 2017. Entry, and species performance overall, varied by location and management level. For instance at Storrs, CT, the Chewings fescues and slender creeping red fescues filled the top turf quality statistical group, with strong creeping red fescue **C14-OS3** at the top. College Park, MD, which typically experiences exceptional summer stress, had hard fescues as exclusively the top performers. But that trend did not hold true for the most southern location, Raleigh, NC, where the top performers were a mix of Chewings, strong creeping red fescue and slender creeping red fescue entries. And interestingly, management level differences play a very important role as lawn height vs. fairway mowing height trials at St. Paul, MN, resulted in vastly different species performance.

Traffic tolerance of entries in this trial is conducted under both fairway mowing height and lawn mowing height. In 2017, traffic was evaluated at six sites: St. Paul, MN, (fairway), East Lansing, MI, (fairway), Storrs, CT, (fairway), Corvallis, OR, (lawn), North Brunswick, NJ, (lawn) and Amherst, MA, (lawn). The fairway sites utilize an apparatus that simulates golf cart traffic and damage. The locations used a similar protocol: two passes per day with the traffic simulator, three times per week from May through September. In 2016, the fairway sites had a surprising level of agreement among the top entries. That changed somewhat in 2017 with several entries performing well at one site, but not another. The entries performing well at both sites include **Sea Mist**, **Compass II**, **DLFPS-FL/3060** and **Resolute**, finishing in the top turf quality statistical group at both locations.

At the Amherst, MA, (lawn height) location the best entries for both wear tolerance and turf quality included the hard fescues **Beacon** and **Jetty**. **Castle** and **Sea Mist** were not as strong for wear tolerance at Amherst but they still finished with high turf quality ratings. At North Brunswick, NJ, the best entries were mainly hard fescue led by **Jetty**, **Resolute**, **Gladiator**, **Minimus** and **Sword**. Contrast these results to the results from the Storrs, CT, site as **Castle** and **Sea Mist** were top turf quality performers in Storrs, but **Beacon**, **Jetty** and other hard fescues were not.

Fairway maintenance levels, particularly in regions where fine fescues may suffer heat and drought stress, is being evaluated in this trial. Sites as diverse as West Lafayette, IN, E. Lansing, MI, St. Paul, MN, and the California Golf Club of San Francisco showed varying results across locations, however with some agreement.

Compass II, **Sea Mist**, **RAD-FC44** were the only consistently good entries at all sites.

Several diseases were rated on this trial in 2017. Red thread (*Laetisaria fuciformis*) was rated at three locations in 2017, with entries such as **Jetty**, **Gladiator**, **Beacon**, **PST-4BND** and **MDHD-14** performing consistently well across all three locations. Pink snow mold (*Microdochium nivale*) was rated at the California Golf Club with **BAR FRT 5002**, **Beudin**, **C14-OS3**, **DLFPS-FL/3060** and **Resolute** showing the best tolerance.

Dollar spot and brown patch can be persistent and troublesome diseases on fineleaf fescues and both of these diseases were noted and rated in 2017. Dollar spot was noted at five locations, with entries such as **Quatro**, **Compass II**, **Castle**, **C14-OS3**, **RAD-FC44** and **DLF-FRC 3338** showing consistently good results across locations. Brown patch was rated twice at Raleigh, NC, with the hard fescues **Gladiator**, **Beacon**, **Beudin** and **Minimus** demonstrating the best tolerance.

Bentgrass

New trials of bentgrass were established in fall 2014, and the first data was released in spring 2016. Two species are included in the latest trials: creeping (*Agrostis stolonifera*) and colonial (*Agrostis tenuis*). Third year data (from 2017) is presented here, although it should be considered with caution since results may change with further testing.

Putting Green Trial

This trial, containing twenty creeping bentgrasses, was established at nineteen locations. Turfgrass quality ratings collected in 2017 again revealed several experimental cultivars that can meet, or exceed the quality delivered by previous top performers **Declaration**, **V-8**, **Penn A-1** and **Luminary**. Entries such as **PST-ROPS**, **DLFPS-AP/3058**, **Piranha**, **DLFPS-AP/3018** and **L93-XD** delivered top turf quality at several sites, but fell off at other sites. For instance, **L93-XD** was excellent in Lexington, KY, East Lansing, MI, North Brunswick,

NJ, and St. Paul, MN, but finished near the bottom of entries at Athens, GA. In some cases, entries were superior to a standard entry such as **Declaration** at a particular location, but not another location. These results emphasize the need to check local results carefully.

This trial was also evaluated at three golf course sites: Los Angeles Country Club in California, the California Golf Club of San Francisco and North Shore Country Club in Glenview, IL. **777**, **PST-ROPS** and **DLFPS-AP/3054** finished with high turf quality at all three locations. Again in 2017, as with 2016, **L-93XD** showed excellent performance at both of the California sites, but finished at the bottom of all entries at the Chicago site. Additionally, **Tour Pro** was a top performing entry at the North Shore site, but finished in the middle of the pack at both California sites.

As with the previous trial, wear tolerance evaluations were conducted at the Amherst, MA, location, starting in 2015. This location imposes wear by dragging a stiff brush across the plots. This action causes bruising and abrasions that mimic different types of damage. In 2017, **DLFPS-AP/3018**, **L93-XD** and **PST-ROPS** showed the best overall quality, finishing in the top statistical group. **Kingdom**, **Piranha** and **Tour Pro** exhibited excellent wear tolerance in three ratings.

An additional ancillary trial was established at Logan, UT, where entries were managed both under traditional irrigation and a reduced irrigation regime. Consistent with 2016 data, in 2017, most of the top entries under normal irrigation levels were also good under the reduced irrigation level. The entries ending in the top statistical turf quality group under both regimes in 2017 include **Kingdom**, **Pure Select**, **Nightlife**, **777**, **DLFPS-AP/3018**, **DLFPS-AP/3058**, **Armor** and **PST-ROPS**.

Bentgrasses are susceptible to many diseases, therefore, disease resistance has always been an important feature of any new bentgrass cultivar. Dollar spot is one of the most damaging diseases on bentgrass and in 2017, dollar spot was noted and rated at multiple locations. **L-93XD**, **Declaration**, **DLFPS-AP/3018**, **DLFPS-AP/3058**, **Luminary**, **GDE** and **Barracuda** had consistently high dollar spot tolerance ratings across



Differences in bentgrass color and texture at Logan, UT.

locations. **Anthracnose** was rated at North Brunswick, NJ, with **Nightlife**, **Kingdom** and **777** showing the highest tolerance ratings. Pink snow mold ratings were again collected at the California Club in San Francisco. 2017 data was consistent with previous results with **777** finishing atop the pink snow mold tolerance ratings.

Fairway/Tee Trial

The 2014 trial consists of fourteen creeping and three colonial bentgrass entries and is planted at nineteen locations. Third year data (from 2017) is normally a reflection of thatch development as well as a response to various diseases.

As with 2016 data, entry differences in 2017 were less than expected at several locations, with very little to no statistical differences in turf quality averages noted at four locations. However, good entry separation was noted at six locations with creeping bentgrasses **Nightlife**, **Chinook** and **Kingdom** as some of the highest rated entries. Past top creeping bents **007** and **Crystal Blue Links** are the entries that any new experimental needs to outperform, and these new entries, as well as **Piranha**, **Armor** and **L93-XD** looked impressive at several locations in 2017.

In 2017, creeping bentgrasses generally outperformed their colonial bentgrass cousins. However, colonial bentgrass entries showed excellent performance at selected sites. For example, colonial bentgrass previous top performer **Greentime** was outperformed by **Musket** and **DLFPS-AT/3026** at College Park, MD, in 2017, where dollar spot resistance seemed to help these entries compete with creeping bent entries. It seems that where the colonial bentgrasses are well adapted, they perform very well. Where colonial bentgrass does not seem to be well adapted, like the mountain west or southwestern states, those entries fall into the bottom 25 percent of all entries.

The Riverside, CA, location utilized a reduced irrigation level but no significant differences were again noted among the entries. However, the Logan, UT, and Fargo, ND, locations managed under reduced irrigation showed very good entry separation with **Kingdom**, **Shark**, **Piranha** and **Crystal Blue Links** performing well at both sites.

At two ancillary traffic locations, Amherst, MA, and Blacksburg, VA, significant entry separation was noted. Colonial bentgrasses **DLFPS-AT/3026** and **Musket** were excellent under the traffic stress at both sites, finishing in the top statistical group for turf quality. Traffic tolerance ratings, evaluated three times at the Amherst, MA, site, however, showed **Kingdom**, **Piranha** and **Nightlife** with some of the highest scores.

Disease resistance is a very important trait for bentgrasses used on fairways or tees. Brown patch, anthracnose and dollar spot were rated in 2017. Brown patch data collected at Ames, IA, showed only **Musket** with any significant disease development. Anthracnose was noted at North Brunswick, NJ, and data showed

DLFPS-AT/3026, **Musket**, **Greentime** and **PST-0CV6** with the least disease.

Dollar spot data again showed the colonial bentgrasses **DLFPS-AT/3026** and **Musket** with some of the best ratings at three locations. Creeping bentgrass entries **Chinook** and **Piranha** also showed excellent dollar spot tolerance across the three locations.

Low Input Cool-Season

In 2015, NTEP established its first management based trial, with seventeen locations that manage under 'low input.' The first trial of this type includes cool-season grass cultivars, experimentals, blends and mixtures of grasses and other species. Thirty-two entries were submitted by sponsors, including single cultivars and blends of Kentucky bluegrass, fine fescue, tall fescue and perennial ryegrass; mixtures of several grass species, with some including strawberry, white or Microclover® (*Trifolium* spp.); and even a western yarrow entry (*Achillea millefolium* L.).

Management is minimal for the five-year trial, with no fertilizer applications or irrigation after establishment, no pest control at any time during the trial, and mowing at 3 – 3.5" on the thirteen standard trial sites. Three ancillary trial sites evaluate the effect of one annual grass pre-emergence application (spring 2016) only, then following standard trial protocols for the remaining four years of the trial. One additional trial location (West Lafayette, IN) made an additional fertilizer application on one half of each plot for 2016 and 2017 only, to evaluate the effect of the small increase of fertilizer on performance and survival. Overall, these locations are maintained very minimally, which is of interest to an increasing number of our customers.

As first year data typically reflects establishment, second year data from any NTEP trial is the first year to evaluate more long-term performance. The entries in this low input trial, with no annual grass or broadleaf weed control, need excellent establishment, and then good ground cover to resist weed invasion and deliver good quality.

With many different species, mixtures with clovers and even non-grasses (western yarrow), turfgrass quality ratings are more difficult to assess, sometimes leading to less significance among entries. However, turfgrass quality ratings collected in year two resulted in larger differences among the entries.

Data was reported from fifteen locations in 2017. The following entries were the most consistent, finishing in the top statistical group at ten locations: **Yaak**, the western yarrow entry, **DLFPS TFAM**, a tall fescue mixture with Microclover®, **DLFPS TFAStC**, a tall fescue mixture with strawberry clover, **Vitality Double Coverage Mixture**, a 90/10 Tall fescue/Kentucky bluegrass mixture, **CRS Mix #2**, a hard

fescue/Kentucky bluegrass mixture, and **Bullseye** tall fescue. However, quality scores across locations were generally low as expected, with no entries at the Raleigh, NC, Lincoln, NE, and Kennett Square, PA, locations finishing with a turf quality average score of at least 5.0, the NTEP threshold for minimum acceptable quality under low maintenance. Therefore, we theorize that the performance of these entries will change a lot, and may continue to decline over the remaining three years of this trial.

Cool-Season Water Use

With the need to reduce turfgrass water use, USGA is partnering with NTEP to evaluate both cool- and warm-season grasses for water efficiency and performance under lower water use. The USGA has paid to install rain exclusion shelters at ten sites, five in the northern or transition zones (to evaluate cool-season grasses) and five shelters in the southern U.S. to evaluate warm-season grass water use and drought tolerance. Within these shelters, cooperators restrict irrigation for a period of 100 days for cool-season grasses, or 120-150 days for warm-season grasses. These 'drought seasons' under the shelters are part of *Approach 1*, which is a measurement of the amount of water needed to maintain a prescribed level of green during that period.

Ten trial locations in the drier western U.S. states (five each for cool-season and warm-season grasses) manage under *Approach 2*, which utilizes three evapotranspiration replacement rates (ET_o). In *Approach 2* locations, researchers replace either 40, 60 or 80 percent of ET_o (as determined by local weather station data) for cool-season grasses, or 30, 45, or 60 percent ET_o for warm-season grasses. This scenario is more typical of irrigation patterns in the western U.S. with 25 inches or less of annual rainfall. *Approach 2* data indicates the reduced irrigation level each entry will survive, and at what level each will deliver acceptable turf quality.

Therefore, the two approaches address the needs across the U.S., from the humid, eastern U.S. with 30 plus inches of annual rainfall but with occasional prolonged drought periods, to the arid western U.S. where annual summer drought periods are expected.

The warm-season version of this trial is being established at ten locations in summer 2018. The cool-season version of this trial was established in fall 2016 or spring 2017 at ten total sites, five under rain exclusion shelters in the eastern U.S. (*Approach 1*) and five in western U.S. field sites (*Approach 2*). The cool-season

version includes fifteen Kentucky bluegrasses, nineteen tall fescues and one perennial ryegrass.

The first data from the cool-season trial was collected in 2017 at six of the ten locations. Four *Approach 1* (shelter) locations collected data during a 100-day induced drought period, and in some cases, large differences were noted in amount of water used by entries. In some locations, the difference between the least water using entries and the most water using entries was two-fold (for instance, 46.7 mm of water to 97.7 mm of water), but very few statistically significant differences were noted, either within Kentucky bluegrass or tall fescue entries. Griffin, GA, was the only *Approach 1* site where significant differences were noted in water used, but only with tall fescue. **PST-R511** and **RS4** tall fescue used the least water at Griffin, along with nine other entries that were statistically similar. The range of tall fescue water use at Griffin was 76.3 – 211.7 mm (LSD=76.3) in 2017. Hopefully, in 2018 we can obtain great statistical significance among *Approach 1* entries.

Only *Approach 2* sites at Riverside, CA, and Las Cruces, NM, collected data in 2017. Both locations ran irrigation at 40, 60 and 80 percent ET_o replacement, while adjusting for any rainfall received during the 120 day drought period. Very little rainfall was noted at the Riverside, CA, location during the 'drought season' while Las Cruces experienced some precipitation from summer storms. Consequently, summer stress was more pronounced at Riverside than Las Cruces.

At Riverside, the 40 percent ET_o irrigation regime was very harsh on all entries, with only **Babe** Kentucky bluegrass delivering acceptable turf quality ratings (>6.0) 45 days into the drought period. Not unexpectedly, no entry showed acceptable turf quality throughout the entire 40 percent ET_o replacement season



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at Riverside. The 60 percent ET_o replacement regime was kinder on the grasses but still, not a single entry delivered an acceptable turf quality ratings throughout the season. Even the 80 percent ET_o regime, which is considered adequate replacement of ET lost for cool-season grasses, reduced turf quality ratings of many entries to below acceptable, at least for rating dates toward the end of the season.

As noted above, the Las Cruces, NM, site did receive some summer rains in 2017, which resulted in acceptable turf quality for more entries and rating dates than at Riverside. Even under the 40 percent ET_o regime, although very little statistical significance was noted, several entries of both Kentucky bluegrass and tall fescue showed percent green cover ratings >50 percent and acceptable turf quality on most rating dates. Data from the 80 percent ET_o regime did show some Kentucky bluegrass entries with statistically better quality ratings, including **NAI-13-14**, **Blue Devil** and **PST-K11-118**. With five *Approach 2* locations collecting data in 2018, hopefully weather patterns can allow for more consistent ratings and greater statistical significance.

Other Species

Other cool-season species, such as prairie junegrass (*Koeleria* spp.), tufted hairgrass (*Deschampsia cespitosa*), rough bluegrass (*Poa trivialis*), supina bluegrass (*Poa supina*) and annual bluegrass (*Poa annua*) are potential sod products, although limited in their utility and geographical area of adaptation.

Native species, such as junegrass and tufted hairgrass, under low maintenance can form a dense sward with an appearance somewhat like perennial ryegrass or Kentucky bluegrass. One tufted hairgrass cultivar has been tested by NTEP (1998 NTEP Fineleaf Fescue trial). The other bluegrass species, rough, annual and supina are still very much under development without a lot known about their performance characteristics and production needs. Other native species, such as inland saltgrass (*Distichlis spicata*) and poverty grass (*Danthonia spicata*), have special traits such as salt tolerance (inland saltgrass) or tolerance to infertile soils (poverty grass), but are probably several years away from commercialization.



007 creeping bentgrass field in Oregon.

WARM-SEASON

In spring/summer 2013, new trials of bermudagrass and zoysiagrass were established, with 35 entries in each trial. In addition, a unique new trial was established in conjunction with USGA. The trial evaluates bermudagrass (15 entries), zoysiagrass (11 entries) and seashore paspalum (2 entries) at eleven locations under putting green conditions.

The final year of data from each of these three warm-season trials is now available from NTEP. Even though each trial features a different set of data, a common theme of all these trials is data on initial establishment from 2013. However, due to the unusually harsh winter that many locations experienced in 2013/2014, several entries were never able to establish at some locations. Data on winter injury was collected and the cooperators were consulted on the condition of their trials. Since 2013-14 was the worst winter in more than thirty years, the decision was made by NTEP to replant several or all entries at the worst winter injury sites. NTEP has never replanted so many entries and locations in our history, but we felt it was necessary to give all entries an equal opportunity to establish and perform. No more replanting will take place for these three trials. The information on the entries replanted at each location is noted on the data tables.

Bermudagrass

The current bermuda NTEP trial contains eighteen (18) seeded entries and seventeen (17) vegetative entries. Many of these entries are experimental cultivars or new commercial cultivars. NTEP evaluates warm-season grasses by comparing seeded and vegetative entries, and also by separately comparing seeded vs. seeded and vegetative vs. vegetative.

The final year of this trial was 2017. Therefore, we now have several years of data that show the potential of new experimental entries. In 2017, **Latitude 36**, one of the top performers in the last trial, was the most consistent entry finishing in the top statistical group at more locations than any other entry. **Patriot**, a cold-hardiness standard that has been tested by NTEP for over twenty years, also performed very well at several locations. Other entries also performing well at many sites include **TifTuf**, **Tahoma 31**, **11-T-510**, **OKC 1302**, and **JSC-2-21-18-v**, all vegetative entries. **Tifway**, arguably the most widely utilized turf bermudagrass in history also performed well overall in 2017, which could mean that the importance of **Tifway** in the marketplace may continue for many years.

Several ancillary trial locations again conducted unique tests in 2017. Traffic tolerance differences were



NTEP 2013 Zoysia trial under artificial shade at Riverside, CA.

noted at Lexington, KY, with **Patriot**, **Tahoma 31** and **Tifway** topping the traffic ratings. And in spring dead spot (*Ophiosphaerella* spp.) ratings collected at Columbia, MO, **OKC 1163**, **OKC 1302**, **BAR C291**, **Astro**, **MBG-002** and **Yukon** showed the highest tolerance ratings.

This is the final year of data from our water use reduction ancillary trial conducted at College Station, TX. Performance differences evaluating drought tolerance have been significant in each prior year. **TifTuf**, **FAES 1325** and **JSC 2-21-18-v** were the top performing entries in 2017, with turf quality ratings of 7.3, 6.9 and 6.9, respectively, where scores ranged all the way down to 4.8.

Zoysiagrass

Meyer zoysiagrass was released in the early 1950's and has been a standard in the industry ever since. **Meyer** is known for its medium leaf texture (for a *Zoysia japonica* type) and excellent winter hardiness. **Zeon** is a *Zoysia matrella* type that is finer textured than **Meyer**. **Zeon** is a standard for use on golf course fairways and tees because it can develop a dense turf at mowing heights of 0.5" or lower. Both grasses are included in this new trial as standard entries.

One of the weaknesses of zoysiagrass is its rate of establishment, especially compared to other warm-season species. Therefore, plant breeders are working to improve spread and recovery rate in zoysiagrass. For

both of these traits, it appears that breeders are making considerable gains. In addition, **Meyer** historically has not performed particularly well in the warmer southeast and southwest locations, therefore zoysia cultivars that perform well in those regions are much needed.

As with the bermuda trial, injury in the winters of 2013-14 and 2014-15 significantly affected some locations. Winter injury was evident at Manhattan, KS, West Lafayette, IN, and Columbia, MO, with turfgrass quality and percent cover ratings being affected by that injury. **Meyer** and **KSUZ 1201** suffered only a small amount of winter kill at those locations (only 1.3 and 9.7%, respectively at Manhattan, KS). The two winters damaged **DALZ 1301** and **FAES 1305** more, however, they recovered enough to provide quality almost equal to **Meyer** and **KSUZ 1201** at the three northern locations. Since then, entries such as **FAES 1312**, **DALZ 1301**, **FAES 1305** and **11-TZ-4321** have continued to recover and are now providing good to excellent quality at the northern locations, along with **KSUZ 1201**. For so long, **Meyer** was the standard for winter tolerance, and therefore, the primary cultivar in use in the northern and transition zone states. However, with these new experimentals, **Meyer** may finally be replaced in this region.

With 2017 as the final year of this trial, zoysia entries that have survived two rough winters, plus two more normal winters have risen to the top at the northern sites. **DALZ 1301** and **FAES 1305** finished

in the top statistical group at College Park, MD, Columbia, MO, and Manhattan, KS. Also finishing well at the three sites were **KSUZ 1201**, **FAES 1312** and **Zeon**. **Meyer** did not perform well at College Park, MD, finished in the middle of the pack at Manhattan, KS, and was very good at Columbia, MO.

As has been consistent throughout each year of the trial, results from the southern locations show other experimental zoysiagrasses provide higher quality turf than

Meyer and **Zeon**. **FAES 1313** is the only entry to finish in the top statistical group at each southern location in 2017. Entries including **FAES 1312**, **DALZ 1303**, and **FAES 1319** performed very well at several locations as well. **Meyer** did perform well at a few locations, such as Fayetteville, AR, but finished outside the top statistical group, and in the bottom third of all entries at most southern locations in 2017, like 2016. **Zeon** performed well at Fayetteville, AR, and Dallas, TX, consistently holding its own against the new experimentals at this and a few other locations. But like **Meyer**, **Zeon** also fell out of the top statistical group at most locations.

Ancillary trials of traffic, drought and shade tolerance yielded good data over the last few years of this trial. The College Station, TX, site imposed significant drought stress on the entries over a three year period, rating turf quality and percent ground cover to measure drought tolerance. **FAES 1305**, **Zeon**, **FAES 1329**, **A-1**, **FAES 1319** and **DALZ 1301** rated the highest for turf quality in 2017 under drought conditions.

Traffic was again imposed on the zoysia entries at the Raleigh, NC, location. **09-TZ-54-9**, **FAES 1304**, **FAES 1312**, **DALZ 1302** and **FAES 1315** (and five other entries) had the highest percentage cover ratings at the end of the traffic season. Shade tolerance was tested at Riverside, CA, with excellent separation among entries. Entries like **09-TZ-54-9**, **09-TZ-53-20**, **DALZ 1303**, **FAES 1329**, **FAES 1309** and **FAES 1322** finishing in the top statistical group.

Diseases on zoysia are not as big a concern as with some other species, however certain diseases can cause significant damage. Dollar spot and large patch



2013 NTEP Zoysiagrass Test at Tucson, AZ, showing winter color differences in February, 2018.

are two of the diseases that can infect zoysia, with data in 2017 from Raleigh, NC, and Citra, FL. **10-TX-12-54**, **FAES 1319**, **FAES 1312** and **11-TZ-4321** had high dollar spot tolerance ratings at both locations in 2017.

Large patch or zoysia patch (*Rhizoctonia solani*) was noted at Fayetteville, AR, in 2017. The entries with the least large patch damage in 2017 include **FAES 1319**, **09-TZ-54-9**, **FAES 1328**, **FAES 1315** and **FAES 1317**.

Warm-Season Putting Green

In the late 1990s, NTEP and USGA collaborated on a trial to evaluate creeping bentgrass and bermudagrass on putting greens situated at golf courses. The purpose of that trial was to evaluate putting green cultivars under actual golf course putting green conditions. For bermudagrass, eight golf courses were chosen in locations as varied as Florida, California, Missouri and other sites. Data collected from that trial (http://www.ntep.org/reports/bg98o/bg98o_02-10f/bg98o_02-10f.htm) showed that bermudagrass could work well as a replacement for creeping bentgrass in the lower transition zone and southern U.S. That trial contained seven bermudagrasses, several of which have become well established in the golf turf industry.

More recently, the USGA is interested in identifying warm-season grasses that can provide acceptable putting surfaces where course owners want to save water, pesticide and fertilizer inputs. In addition, the USGA is interested in evaluating potential new putting green grasses that can be mowed higher, do not require as much cultivation and vertical mowing, but still provide a good quality playing surface. Hence, the idea for a new

collaborative trial that we established in 2013.

A new twist on this trial is that we have included not only bermudagrass, but also zoysiagrass and seashore paspalum. Seashore paspalum has been utilized on putting greens for the last decade or so, but zoysiagrass has almost no history as a putting green surface in the U.S. (zoysia has been a mainstay of 'summer' putting greens in Japan for decades). Including three different species in one trial offered challenges, particularly in management specifics that may differ from one species to another. However, eleven trial cooperators (seven at university sites, four on golf courses) felt up to the challenge and the trial was born.

One of the goals of the trial is to maintain consistent putting green speeds of at least 9 feet on the stimpmeter. This speed is adequate for most mid-level public and private courses where reduced maintenance inputs and costs are necessary for the course to be profitable. How to maintain that speed is up to the site manager (or golf course superintendent), but a set of guidelines were developed to help manage the trial. In addition, it was determined that since some locations could suffer winter kill each year, turf covers would be provided to those locations and would be used as standard maintenance practice (adopting what a mid-level golf course may do to protect their investment). The use of covers came into focus the first winter, with the severe cold temperatures.

As explained over the last few updates, despite the covers that were used at several locations, winter injury from 2013-14 was significant at some locations. This winter injury caused NTEP to replant some or all entries at four locations in summer 2014. Therefore, establishment data collected during the trials' first year (2013), was collected again at several locations in 2014. And several trial locations did not establish properly, or were set back by the winter of 2013, therefore, only a small amount of quality, density, disease and ball roll data could be collected during the first two years. The winter of 2014-15 was also colder than normal in some locations, which delayed some entry development and hence, collection of some of the more advanced data parameters. Also, various issues led to the unfortunate abandonment of the trial at Tequesta, FL.

In this final year of the trial, **MSB-264** continued its top performance by finishing in the top statistical group for turf quality at all eight locations submitting data. **08-T-18** and **MSB-265** finished in the top statistical group at seven locations. **OKC-13-78-5** also demonstrated good turf quality at several locations, with top statistical group performance at five sites. Significant differences in appearance ratings such as genetic color, density and leaf texture were noted among entries, which largely led to the quality ratings separation. Interestingly, fall color retention ratings showed significant differences, but they varied by

location. In other words, an entry may exhibit good late fall, or even winter growth at one location, but not at another location.

Generally, less separation was noted among zoysia entries, than their bermuda counterparts. For zoysia in 2016, several experimental entries, particularly from the Texas A&M-Dallas (DALZ) University research program, produced turf quality that rivaled many of the bermudagrasses. **DALZ 1308**, one of the best zoysia entries the first four years, showed consistent performance in 2017 with top statistical group finishes at several locations. **DALZ 1306** and **DALZ 1307** also performed well overall. Many of these entries performed as well or better than **Diamond**, the original zoysia putting green cultivar.

The two seashore paspalum entries showed reasonable quality throughout the trial period. Both **UGA 143** and the standard entry **SeaDwarf** performed very similarly at most locations in 2017 with no statistical difference for turf quality among the entries. Also, as expected, both seashore paspalum entries died at the northern locations of Lexington, KY, and Bloomington, IN, and did not perform well at the Richmond, VA, location.

Ball roll measurements were collected at six locations in 2017. As in past years, most locations did not record ball roll distances that met our minimum threshold of about 100 inches of roll (250 cm) using the stimpmeter (on at least one rating date). Tucson, AZ, and Mississippi State, MS, were the only locations to achieve ball roll distances on bermuda of at least 100 inches on any rating date. The bermuda entries **FAES 1302** and **CTF-B10** delivered 100-inch ball rolls on five of six rating dates.

In the first few years, none of the zoysia or seashore paspalum entries rolled at least 100 inches, however, that changed in 2016. In 2017, a few zoysia entries had 100+ inch ball roll ratings on one date at Tucson, AZ, while **DALZ 1308** had showed ball roll distances of 100 inches on two rating dates in Tucson. No other zoysia or seashore paspalum entry had a 100 inch or greater ball roll at any location in 2017.

St. Augustinegrass and seashore paspalum cultivar development was fairly limited in the U.S. for a long while. The situation changed in the early to mid-2000s when new plant breeders were hired at southern universities like Texas A&M, University of Florida and North Carolina State University. Now, with those folks in place and with a major federal (USDA) grant from the Specialty Crop Research Initiative (SCRI), an increase in breeding of these two species, along with bermuda and zoysia, is occurring across the southern U.S. Within a few years, growers and consumers will see new cultivars of St. Augustinegrass and seashore paspalum in the marketplace. These new cultivars will have improved drought and salt tolerance, as well as



Harvesting TifTuf bermudagrass at Super Sod in Georgia.

other improvements. To evaluate some of those new experimental grasses that may make the marketplace, NTEP initiated new trials of St. Augustinegrass and seashore paspalum in summer 2016. The first data from those trials (2017) is now available and is discussed below.

St. Augustinegrass

St. Augustinegrass is a species where several older cultivars are still competitive in the marketplace. **Floritam**, developed by the University of Florida and Texas A&M and released in 1973, **Raleigh**, a cold tolerant cultivar and newer releases **Mercedes** and **Palmetto** still dominate the U.S. market. In some areas, sod producers grow and market their own local selections while there are still common-type cultivars, like **Texas Common** sold extensively in some markets.

Our newest St. Augustinegrass trial includes three standard entries (**Floritam**, **Raleigh**, and **Palmetto**) and twenty-four experimental entries, planted at ten locations. Turf quality data from the first full year of evaluations (2017) showed several entries often outperforming the standard entries. However, none of the entries were in the top turf quality statistical group at all six reporting locations.

XSA 10403 was the top entry at Citra, FL, and Raleigh, NC, while also finishing in the top statistical group at Starkville, MS. **DALSA 1502** was also an excellent entry in 2017 finishing in the top turf quality statistical group at four of the six locations. **FSA 1601** and **DALSA 1404** were top performing entries at two locations each. In general, it seems there are many new experimental St. Augustinegrasses that may rival, and eventually replace standard entries such as **Floritam** and **Raleigh**.

Seashore Paspalum

Seashore paspalum is known for its salt tolerance, however some cultivars are valued for their turf quality as well. NTEP started testing of seashore paspalum for the first time in 2007. Eight new entries plus two standards are included in the new seashore paspalum trial, planted at eight locations in 2016.

Summarized turf quality data from 2017 at six locations shows good performance by several new experimental entries. **UGP 73** was the top performing entry at Stillwater, OK, and College Station, TX, in 2017, while also finishing in the top statistical group at Fayetteville, AR, Riverside, CA, and Starkville,

MS. **UGP 94** also performed well with top statistical group finishes at four locations. Surprisingly, **Salam**, a standard entry, was the top performer at Riverside, CA, and Starkville, MS. Another standard entry, **Sea Isle I** was in the top statistical group at four locations. With the cold January temperatures of 2018, and the temperature swings of late winter through spring 2018 in much of the eastern U.S., the results for both the seashore paspalum trials could change significantly this year as data from winter survival and spring performance are collected.

Buffalograss

There has not been sufficient interest to start a new buffalograss trial, therefore, the data that we compiled from 2002-2006 is the most recent we have available. Considering the four years of data from the 2002 trial, cultivar performance depended mainly on geographical location. The vegetative cultivar **Density** had high quality ratings in the southern locations of Tucson, AZ, Riverside, CA, and Dallas, TX, with lower turf quality ratings, relative to other entries, at more northern locations. **Legacy**, another vegetative entry, had the highest quality rating at Logan, UT, Manhattan, KS, and Lincoln, NE. Several seeded entries again performed well during the trial period, with **Tech Turf 1** and **Bowie** each performing well at more than one location. In addition, **Tech Turf 1**, **Density** and **SWI 2000** were consistently the fastest to establish.

A few buffalograss cultivars have been released

since our last NTEP trial was initiated, two of those cultivars from the University of Nebraska. **Prestige** is a commercially available vegetative cultivar released in 2003. And most recently, the University of Nebraska released the seeded cultivar **Sundancer**.

Centipedegrass

Centipedegrass performs well in the more acidic, dense soils of the southeast U.S. and does so with probably the least maintenance required of any warm-season species. Curiously though, improved centipedegrass cultivars have been slow to become commercialized. In fact, NTEP has never tested centipedegrass due to the lack of a significant number of cultivars available. Seeded centipedegrass cultivars are dwarfed in the marketplace by common centipede, the major centipedegrass seed sold. A new cultivar, **TifBlair**, reportedly more cold-tolerant than other cultivars, has been commercialized within the last several years.

Kevin Morris is executive director of the National Turfgrass Evaluation Program (NTEP).

All photos by Kevin Morris.





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