

TURFGRASS RESEARCH IN WASHINGTON, D.C., AREA NATIONAL PARKS



Figure 1. The Fourth of July celebration on the Washington Monument grounds in Washington, D.C., poses a real challenge to turfgrass managers. As many as 1,000,000 people turn out for the annual fete, compacting grasses and wearing them down to dirt.

cultural resource parks. For certain park purposes, native grasses may be a good choice for low maintenance, but they may not hold up to the pressures of high use areas. Furthermore, they may not be available for use in many cultural park settings. Turfgrasses on the other hand, require attention that may not be environmentally sound. Use of natural or artificial pesticides, for instance, have potential negative environmental effects and can be costly to purchase and apply. Additionally, nearly all turfgrasses are nonnative.

TURFGRASS RESEARCH

So how do we select and grow good turfgrass in parks with minimal effort, cost, and disturbance to ecosystems? Turfgrass research has answered many of these questions (see the companion article on turf selection and care on page 30) and continues to be important in making site-specific recommendations. Since 1979, the NPS National Capital Field Area has participated with the National Turfgrass Evaluation Program (NTEP) in conducting turfgrass research. This program is sponsored by the National Turfgrass Federation, Inc., and the United States Department of Agriculture in Beltsville, Maryland, and coordinates testing of over 600 grasses across the United States and Canada. The program accepts new genetic seed stock from seed companies and plant breeders, organizes and mails seed to cooperating colleges and universities and other interested technical participants, collects test results, and releases data summaries. The cooperating university turfgrass researchers prepare, seed, tend, and evaluate the research plots. Each individual test is programmed for a 4-5 year field evaluation. The study period spans different weather conditions and use situations, thus providing an excellent overall evaluation of performance. Also, since tests are located in many geographic

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Editor's note: Turfgrasses are predominantly nonnative, require regular care that at times may not be ecologically sound, and are not appropriate in many areas of the national park system. This article does not discuss policy issues related to where and when turfgrass should be used. Rather, it is intended to help managers make wise turfgrass choices in parks where the use of sod is long-established and considered appropriate.

WHAT DO KITE FLYING, gatherings like the Million Man March, and visiting a soldier's grave all have in common? Each is an activity that takes place on *turfgrass* in units of the national park system. While the presence of healthy sod is not the focus of such activities, it is a key component in providing for visitor use and enjoyment, especially in urban or historical parks.

The demands we make on turf in national parks are diverse and often overlooked. Turfgrass should blend in with the natural surroundings and not become a focal point, whether beautiful, deep green,

withered, or dead. In historical parks, turf may need to match the cultural landscape being presented as a snapshot in time. In recreational settings, turfgrass needs to be durable and stand up to constant compaction from large gatherings. Around visitor centers and other park facilities, turfgrass may simply be used to help beautify an area.

Turfgrass, however, plays a much more important role than just providing beauty. Made up of miles of roots, thousands of grass plants per square yard help to conserve and stabilize soil. A thick, healthy turfgrass stand is a natural filter that absorbs great quantities of rainfall, purifying it as it slowly drains into the soil. Grass provides a natural cooling effect on hot summer days by reducing air temperatures at the ground 15-30 degrees Fahrenheit. Turfgrass is also a pleasant, safe surface for informal games and picnics or formal organized sports. The challenge is to develop and keep turfgrass stands that provide these benefits but do not require constant care, pampering, or great expertise to manage.

Managers now recognize the increasing importance of adopting sustainable management practices in both natural and

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areas, excellent *cultivar* (short for “cultivated variety,” which means improved strain) recommendations can be developed for local turfgrass users in most any area.

The National Park Service is interested in evaluating cultivar performance on heavily impacted, low maintenance park lands. Tests have been planted and evaluated on the Washington Monument grounds, National Mall, and East Potomac Park in Washington, D.C., Prince William Forest Park in Northern Virginia, and Antietam National Battlefield in Sharpsburg, Maryland. The growth conditions at these sites are different from those of the university experiment stations across the continent largely because of the tremendous impact that visitors and their feet have on grass and soil. For example, approximately 1,000,000 people visit the Washington Monument grounds on the Fourth of July (fig. 1, page 27) where the soil compacts nearly as hard as concrete. Likewise, the wear and tear on the National Mall turfgrass is tremendous considering 13-33 million people visit this site annually. In 1991 alone, approximately 2,100 permits, or seven per day, were requested for events as benign as a one-person newscast to very large gatherings on the National Mall. The Gulf War victory celebration brought over 1,000,000 people to the National Mall to view military hardware (fig. 2). Everything from tanks to Apache helicopters to harrier jets were displayed, most on the grass, making the need for sound resource management recommendations obvious (fig. 3).

The lion's share of the cooperative research has been on the Washington Monument grounds. We have planted, grown, and evaluated experimental plots there continuously since 1980. We have tried many grasses and varieties and most have failed the test! Only a handful of Kentucky bluegrass (fig. 4) and perennial ryegrass varieties have delivered acceptable results and even fewer tall fescues have survived over the years.

Conducting research on a national park site is not always as easy as a university or USDA experimental area, for researchers must control as many variables as possible. We go to great pains to find uniform, level soils, provide measured, accurate ap-



Figure 2 (above). The Desert Storm celebration, held in June 1991 on the National Mall, drew 1,000,000 people over 4 days to view 20 pieces of military hardware on display.

Figure 3 (right). Just 6 weeks after being worn to dirt, the same helicopter display site has bounced back solely as a result of watering. Kentucky bluegrass is generally resistant to compaction, but cultivars differ in their resilience—see figure 4.



plications of water and fertilizers, and follow time-honored data collection procedures and analyses. However, at park sites, some variables are not controllable. For instance, construction workers parked heavy equipment on a tall fescue evaluation plot near the Smithsonian Institute and built a fence around it. Another plot was covered with straw and artificial walkways for the display of twelve acres of quilts just 3 weeks after seeding! Trucks, large tents, concert stages, and display booths have all covered our sites, and engineers have constructed new sidewalks through or next to them. Even on occasion, marijuana “grass” seed can be found, so thoughtfully dropped or left behind by others.

Other cooperative research projects include testing grasses in heavily shaded areas that have compacted soils and improving a very acidic, pyrite mine spoil site with compost materials in Prince William Forest Park. Antietam National Battlefield offers additional research opportunities for evaluating grasses in a national cemetery. The battlefield is also evaluating a soil amendment for its potential to limit soil compaction in a well-worn grass walkway.

RESEARCH METHODS

The National Turfgrass Evaluation Program conducts experiments using small (25 square foot) plots of each grass type. Initially, a test area is selected based on

suitability to the test. If the primary goal is learning the incidence of disease, then we locate tests in areas with heavy disease pressure or in areas where disease can run rampant. For example, summer diseases need high temperature, high humidity, and moist conditions to thrive. Therefore, areas with low relative elevation or areas next to woods provide additional moisture or restricted air flow that encourages disease development. If the objective is to test tolerance to compaction or traffic, we choose areas that provide a uniform, consistent wear pattern across the experiment. Drought tolerance can be tested using reduced or no irrigation. Cold tolerance can be evaluated by planting the grasses outside their zone of adaptation.

A test area needs to be uniform in soil type, drainage, etc., so that differences in soil or water-holding capacity will not give one grass an advantage over another. All vegetation is removed from the site, the area is cultivated, fertilized, and prepared into a firm, smooth seedbed. Then, a measured amount of each seed is planted using a 5 x 5 ft planting box to prevent the seed from blowing into adjacent plots. After seeding, the entire area is covered with seeding cloth to prevent washing of the seed.

Each grass is planted, or replicated, three times in a random fashion to further negate any differences in soil, drainage, or disease development in the plot



Figure 4. This national Kentucky bluegrass test plot—cultivar ISI-21—persists in good health 3 years after establishment on the Washington Monument grounds; all other surrounding bluegrass cultivar plots have died.

area. Replications allow the researcher to determine if the response of one grass to a particular stress is accurate or happened by chance. If one plot of a cultivar is damaged from disease but the other two plots are not, then uniform disease development did not occur. If all the grasses in one corner of the plot are infested with a particular insect but do not show damage in other areas, then the insect is not distributed uniformly.

The National Turfgrass Evaluation Program has developed a standardized data collection format that all cooperators use when collecting data. Data on many characteristics is collected by the researcher: some data characterize or describe each grass (descriptive) and others record the grasses' response to various stresses. Examples of descriptive characteristics are leaf texture (fineness of leaf), genetic color (shade of green), and density (number of plants per unit area). These characters are collected at many sites and do not vary much from location to location.

Stresses that may influence the quality of a turf stand include diseases, insects, drought, heat, cold, poor soil, low fertility, wear and tear, and others. Researchers attempt to rate the grasses' response to these various stresses as they occur. Often, however, several stresses may affect a grass at one time, making it difficult to separate responses to each stress. Therefore, researchers collect the most important rating, turfgrass quality, each month throughout the growing season. Quality ratings reflect many factors in-

cluding leaf texture, color, density, disease and insect tolerance, weed invasion, drought, and cold.

Many turfgrass characteristics are subjective, due to personal bias of the researcher. This significantly influences whether a grass receives a high or low rating for turfgrass quality. Some characteristics, such as depth of thatch, can be measured quantitatively. However, measurements of many characteristics are difficult and time consuming to make. Therefore, researchers use the NTEP format

and rate most grasses on a scale of 1-9 with 9 being highest quality, darkest green, finest leaf texture, least disease, etc. With proper training, test personnel can become quite proficient in rating grasses quickly and accurately.

After data is collected for an entire growing season, they are assembled and sent to our facility in Maryland. We check the data, correct inaccuracies and perform statistical analyses on each data set. Annual progress reports are produced containing all the data collected on each turfgrass species from each location. These summaries are available for a modest fee.

APPLYING THE RESEARCH

The test data have been used for many other national park system areas where recommendations to improve turfgrass are required. Generally the areas most in need of these recommendations are those with large acreages of grass where park visitors tend to gather. By providing the improved turfgrass recommendations, soil test data, and improved management guidelines, a much improved, functional turf stand is achieved. This is particularly important when one considers that over 100 Kentucky bluegrass cultivars are on the market and, without field testing, selecting the right variety for any single site is very difficult. The same is true for tall fescue, fineleaf fescue, perennial ryegrass, zoysia, and other grasses (see Table 1, page 31). For example, "Monopoly" is a Kentucky bluegrass cultivar that has performed consistently better than most

grasses tested over the past 15 years on the Washington Monument grounds. This cultivar is lighter green and generally less attractive than many others, but it withstands heavy foot traffic and resulting compacted soils. "Midnight" Kentucky bluegrass, on the other hand, is an attractive, dark green, dense cultivar that has never survived more than 1 year in the Washington Monument tests.

The three research partners have also cooperated to improve the turfgrass quality of the National Mall. This project involved installing a zoysia and tall fescue plot near the Smithsonian Institute and the Capitol. The objective was to provide ideal conditions by encouraging the zoysia in summer and then managing the tall fescue during the winter. This mix provides a good balance as zoysia prospers under hot, dry, and heavy use conditions prevalent in summer, while tall fescue performs well during the cool, moist winter months. This mixture has performed well and remains under evaluation. If it proves acceptable, then the National Park Service will alter its management of the mall turfgrass.

A further example of the usefulness of these data is the need for improved grasses on Liberty Island where the Statue of Liberty resides in New York City. Liberty Island receives heavy visitation and impacts similar to those of the Washington Monument grounds. Data collected at the Washington Monument, other park sites, and nearby Rutgers University in New Jersey, have lead to improved turfgrass recommendations for the Statue of Liberty. Perhaps other parks will benefit from this research.



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