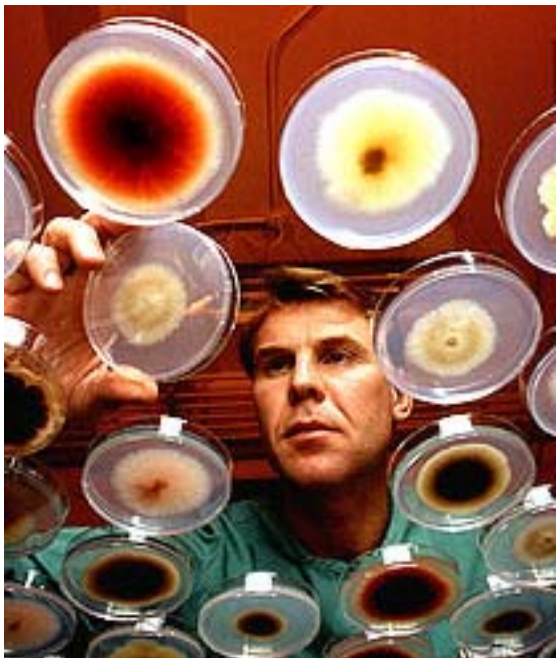
Turfgrass and Environmental Research Online

...Using Science to Benefit Golf



The National Turfgrass Research Initiative proposes a $32.4 million turfgrass research program within the Federal Government's USDA, Agricultural Research Service (ARS) to address the national concerns facing the turf industry by hiring federal researchers and providing funding to universities for cooperative, team research.

Volume 5, Number 10
May 15, 2006

PURPOSE

The purpose of *USGA Turfgrass and Environmental Research Online* is to effectively communicate the results of research projects funded under USGA's Turfgrass and Environmental Research Program to all who can benefit from such knowledge. Since 1983, the USGA has funded more than 290 projects at a cost of $25 million. The private, non-profit research program provides funding opportunities to university faculty interested in working on environmental and turf management problems affecting golf courses. The outstanding playing conditions of today's golf courses are a direct result of ***using science to benefit golf***.

The National Turfgrass Research Initiative

Kevin N. Morris

SUMMARY

The turfgrass industry encompasses 50,000,000 acres in the U.S. with an estimated annual value of $40 - 60 billion. With its tremendous growth in the last 15-20 years and with U.S. society becoming more health conscious, the turfgrass industry is increasingly scrutinized and criticized for its use of water, pesticides, and fertilizer. Reducing these inputs is critically important for the survival of the industry. In addition, turfgrass has many positive benefits to society, such as protecting soil and water, providing safe playing surfaces for children, and heat reduction in urban areas.

- To address these concerns while documenting and improving upon turfgrass' benefits to society and the environment, the National Turfgrass Research Initiative (NTRI) has been developed.
- NTRI proposes a $32.4 million turfgrass research program within the Federal Government's USDA, Agricultural Research Service (ARS).
- NTRI addresses the national concerns facing the turf industry by hiring federal researchers and providing funding to universities for cooperative, team research.
- NTRI emphasizes basic research--long-term, risky and expensive research unlikely to be conducted by state universities and private companies.
- The basic research that NTRI conducts will best address those critical issues and needs while improving turfgrass science.

The annual value of the turfgrass industry in the U.S. is estimated at $40 to 60 billion. This figure includes the cost of establishing and maintaining turfgrass on golf courses, athletic fields, parks, home lawns, roadsides, sod farms, grounds of commercial buildings, hospitals, and countless other areas. It is estimated that turfgrass covers 50,000,000 acres in the U.S., making turf the fourth largest U.S. crop in acreage. According to estimates, there are over 31,000,000 acres of irrigated turfgrass in the U.S. (9), making turfgrass the largest irrigated U.S. crop.

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In addition, the turfgrass industry is growing rapidly in size and scope. For instance, in Maryland, the acreage of turfgrass increased 95% from 1987 to 1995 (18). Collectively, the turfgrass and other green industries in the U.S. (trees, shrubs, flowers, interior landscaping, etc.) generate $147.8 billion dollars in annual sales and provide a livelihood to a substantial portion of the population in many far-reaching areas (5).

Turfgrass has multiple applications, many of them functional in nature. They include safety of athletes, filtering pollutants in urban runoff, eliminating dust along airport runways, and reducing soil erosion. Turfgrass plays an important role in improving the quality and safety of our environment (1). Turfgrass has been shown to sequester, or capture, large amounts of atmospher-

ARS has over 2,100 scientists nationwide, most conducting basic research on crops and animals.

USGA Turfgrass and Environmental Research Online 5(10):1-10.
TGIF Record Number: 111445

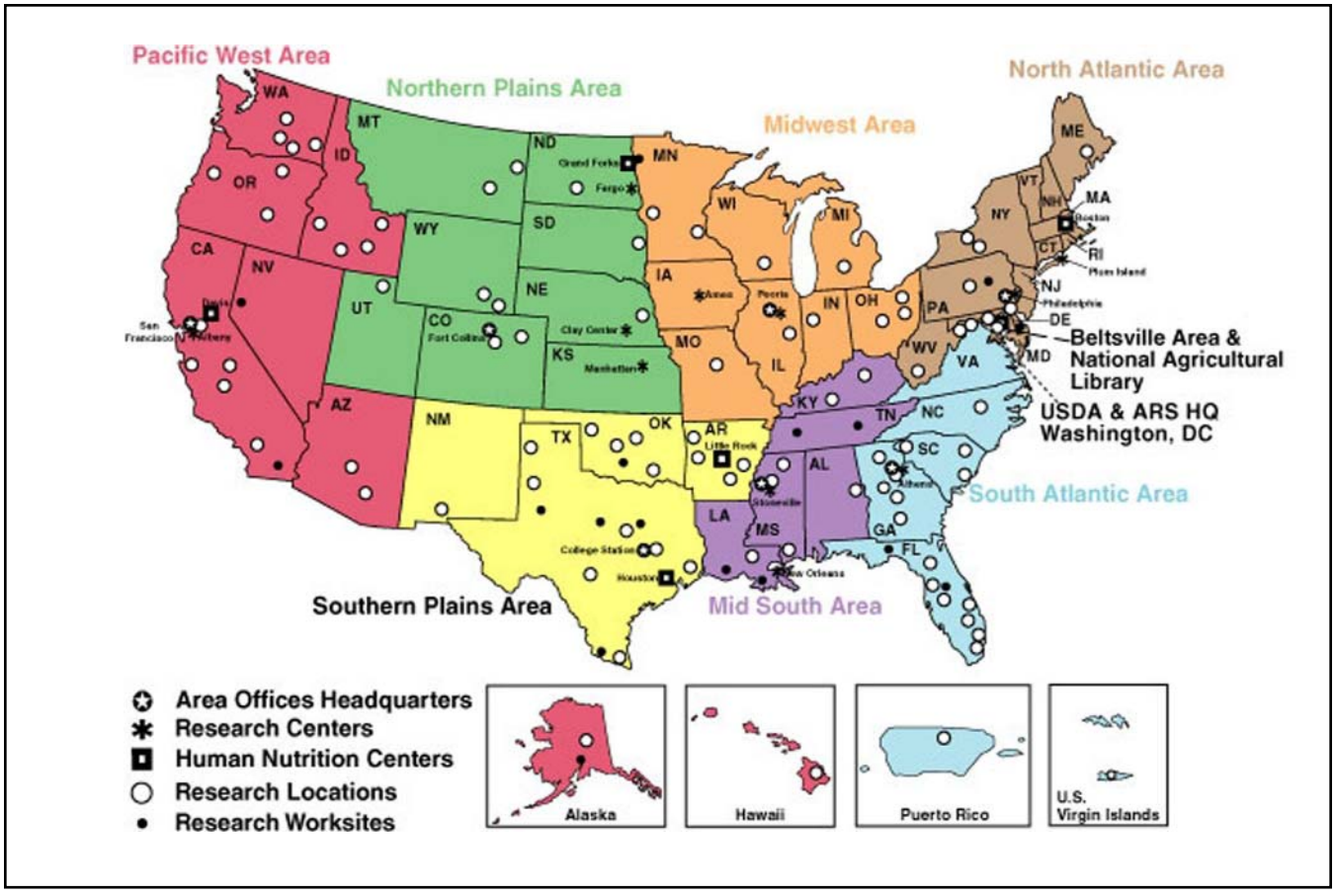
ic carbon in its extensive network of roots and plant parts (12). Carbon sequestration is considered to be an important factor in the fight against global warming. Qian and Follett (12) estimate that the amount of carbon sequestered by turfgrass is equal to the potential of Conservation Reserve Program (CRP) lands in the U.S.

Even the aesthetics, or beauty, of turfgrass play an important role in society. Studies have shown that hospital patients with rooms overlooking nicely landscaped areas have reduced levels of stress, and thereby improved recovery, compared to those patients in rooms with views of buildings (15, 16, 19). According to a Gallup poll, 44.1 percent of U.S. homeowners surveyed said an increased real estate market value was the most important benefit of well-maintained landscaping (4). Gallup also estimates that real estate values increase by up to 15% when homes have well landscaped properties.

Turfgrass Research in the U.S.

Turfgrass research in the U.S. is almost exclusively conducted by either state universities or private, for-profit companies. Private companies conduct research on fertilizers, new grass cultivars , pest control products, etc. for their own internal use in research, development, and marketing. The information obtained from for-profit companies' research is proprietary and most often not released to the public. However, for-profit companies do supply funding to university researchers to test products and to help develop recommend rates and uses.

There are several non-profit organizations such as the United States Golf Association (USGA), Golf Course Superintendents Association of America (GCSAA), National Turfgrass Evaluation Program (NTEP), and Turfgrass Producers International (TPI), that also



USDA's Agriculture Research Service has scientists at 100 locations in the U.S., many housed at or close to state land-grant universities.

fund turfgrass research at state universities. USGA has the largest research funding program averaging about $1,000,000 annually. NTEP, GCSAA, and TPI collectively fund approximately $1,000,000 in turfgrass research annually. There are also various state and local turfgrass organizations that provide funding to state university research programs. In total, it is estimated that private companies and not-for-profit organizations support $10,000,000 in turfgrass research annually.

Many states have at least one university (and in some cases, two or more) with a turfgrass research program to serve the needs of the citizens and the turfgrass industry in that state. Funds for those research programs come from the private entities listed above, state government funding as well as through the Federal Government's United States Department of Agriculture (USDA), Cooperative State Research, Education, and Extension Service (CSREES). CSREES, with an annual budget of $1 billion, provides funding to state universities for agricultural research, education, and extension related activities.

These funds are directed to scientific disciplines and crops, including turfgrass, however, most of that funding is used for faculty salaries or extension activities. Very little, if any, of CSREES funding is directed to dollars for turfgrass research. Therefore, the activities of state university researchers are mostly limited to what the states themselves, private industry, and organizations such as USGA and NTEP are willing to fund.

Applied Versus Basic Research

As noted above, almost all turfgrass research dollars (excluding salaries) are provided by the turfgrass industry or industry associations. This type of support goes almost exclusively to fund “applied” research, rather than “basic” research. Applied research is problem-solving research, addressing and solving problems that are seen in the field by end-users such as golf course superintendents, athletic field managers, or homeowners. A private company that develops fertilizers or fungicides may fund applied research at a state university to test their new products for efficacy. The results from applied research are directly applicable to the end-user and often help them make short-term purchasing and/or use decisions. Obviously, applied research is very beneficial to end users as it helps them make day-to-day management decisions. However, the shortcoming of applied research is its reliance on short-term problem-solving.

Association members, company owners, or stockholders need to see results in the short-term, as their investments are important to them. Therefore, long-term, basic research is much more difficult for these organizations to fund. Basic research tackles the tough problems, consequently it is inherently a greater risk. For example, basic research unlocked the secret that day length significantly affects plant growth and development. Basic research resulted in the development of hybrid seed corn, a huge advance in corn production. And more recently, the Human Genome project, a highly successful effort to identify the location of genes for disease susceptibility, abnormalities and critical human traits, is classic basic research. This type of research may not pay future rewards, but if it does, they are often large breakthroughs resulting in a quantum leap understanding of problems, development of new technologies, or important improvements in management strategies.

Issues Faced by the Industry

With the turfgrass industry rapidly growing, there are significant issues that must be addressed to ensure the benefits of turfgrass are available to all our citizens. Some of these issues are:

Reduce Water Used and Utilize Recycled Water

Drought conditions in many areas of the U.S. have resulted in watering bans on lawns, landscapes, and golf courses and restrictions on planting turfgrass by local jurisdictions. Due to incredible population growth in the drier, western

To increase the genetic diversity of U.S. corn, ARS collects and combines exotic germplasm, such as this unusually colored and shaped maize from Latin America, with domestic corn lines. ARS collects and improves germplasm of many other crops, as well.

states, many areas have instituted lawn watering restrictions, including Las Vegas, NV (7) and Denver, CO (3). Even the wetter, midwestern and eastern states have enacted watering bans, or are considering doing so (13, 20). Local communities are sometimes affected as there are concerns about the irrigation of parks and athletic fields reducing water table levels (17).

Reduce Pesticide Use and Develop Biological Controls

Concerns over the impact of pesticides on human health have resulted in pesticide bans in some local communities. The city of Toronto, Canada has banned the use of pesticides on lawns, parks, golf courses, commercial properties, and any other turfgrass site (14). In addition, more and more jurisdictions in Canada and the U.S. have enacted at least partial bans, or are considering banning the use of pesticides on turf.

Reduce Fertilizer Use and Protect Surface Water and Groundwater

Nitrate and phosphorus pollution of waterways and groundwater supplies have prompted some states and jurisdictions to require reduced fertilization of turfgrass. Minnesota recently passed regulations restricting the use of phosphorus on turf due to the possibility of surface water and groundwater contamination (8). In an effort to improve and protect the quality of Chesapeake Bay water, the Maryland legislature passed nutrient management guidelines for turf (6). Other states are considering adopting similar proposals to regulate turfgrass fertilization.

Address Safety Concerns on Athletic Fields and in Parks

Overuse of athletic fields and budget cuts for maintenance have resulted in unsafe conditions on some fields. Borkowski (2) reported on safety and liability issues in high school soccer, in some cases due to debris and holes in fields. He stated that 25% of injuries in high school soccer are playing surface related. In some cases, these unsafe conditions lead to parental concern and action. The Parents United for D. C. Public Schools (11) commissioned a law firm to study and report on public school athletic facilities in the District of Columbia. Their reports states "... D. C. Public Schools today fail to meet the most basic standards of adequacy for athletic programs and facilities...and run the risk of millions of dollars in legal liability in the almost certain event of a student-athlete's serious injury".

Increase Turfgrass Genetic Diversity

Turfgrass germplasm diversity needs to be increased and preserved for future generations. Germplasm is generally considered to be plants with interesting genetic traits that may be useful in

developing improved grasses. Germplasm improvement is a critical component of plant science and having a wide range of germplasm available is important for breeding better grasses. Unfortunately, unlike most other crop species, very little turfgrass germplasm is collected and placed into public germplasm banks.

Morris and Hossain (10) reported that of thirty-eight publicly funded germplasm collection trips for grasses, only two specifically targeted turfgrass and not forage grass. Very little turfgrass germplasm is held by the federal government, which stifles overall turfgrass improvement. Having less germplasm in the public domain also increases the potential of a major disaster, such as a new disease or insect wiping out turfgrass stands.

Better Documentation on the Benefits of Turfgrass

Turfgrass is often characterized as simply having aesthetic value, and no functional role in society. Often, turfgrass is blamed for increased levels of nitrates and phosphorus in surface water and groundwater, abuse of water available in communities due to irrigation, and overuse of pesticides for "beauty only". There is little understanding among the general public of the importance of turfgrass in protecting soil and water, heat reduction, dust control, etc., even though there is data to support these claims. One avenue to obtaining and releasing information on turf's benefits is through large, coordinated research programs.

How the Federal Government Can Help

The Federal Government, through the USDA, funds basic and applied research on many crops and for many agricultural industries. The USDA's Agricultural Research Service (ARS) is the "in-house" research arm of the USDA, with a $1 billion annual budget, and 2,100 scientists at 100 locations. ARS conducts research on every-

Not only is poinsettia the most popular Christmas plant, it is the number one flowering potted plant in the United States, all thanks to ARS. ARS researchers took the wild poinsettia plant from Mexico, determined the exact conditions needed for the leaves to change color, and devised precision growing methods to enable massive production.

Acreage of Selected Crops in the US[1]	
Crop	**Acreage**
Corn (grain & silage)	74,914,515
Soybeans	72,399,844
Hay/Forage (all crops)	64,041,337
Turfgrass (all uses) [2]	50,000,000
Wheat	45,519,976
Cotton	12,456,162
Orchards	5,330,439
Barley	4,015,654
Vegetables	3,698,744
Oats	1,996,916
Peanuts	1,223,093

1 2002 Census of Agriculture, USDA, National Ag. Statistics Service (NASS)

2 Estimated acreage; NASS only collects data on turfgrass sod production.

Table 1. 2002 acreage of selected crops in the U.S. Turfgrass acreage was estimated to be approximately 50,000,000 acres in the U.S. in 2002 making it the fourth largest crop overall and largest irrigated crop in the nation.

thing from apples to catfish to petunias, with most of the research being basic in nature. Understandably, ARS has significant programs for the big crops such as corn, wheat, and soybeans. However, ARS also has significant programs for industries such as aquaculture (fish farming) and floriculture (floral and nursery crops). There are currently 50 ARS research projects for catfish and trout alone while over $6 million per year is spent by ARS on floriculture research. This research is critical for these industries, helping them make giant strides in advancing the science in their industry and making large improvements that benefit end-users. Could the same be done for the turf industry?

The turfgrass industry wants to address the issues listed above and desires to be part of the "solution" rather than the "problem". However, we want to address these critical issues with science-based information and with improvements in turfgrass development and management. Since these issues are national in scope and importance, the turfgrass industry feels that ARS is the appropriate agency to conduct the needed research .

What is the Turfgrass Initiative and Why is It Important?

The National Turfgrass Research Initiative (NTRI) is the blueprint for a coordinated national research program to be funded through USDA-ARS and conducted through a coalition including the USDA, the university research community, and the turfgrass industry. NTRI discusses the industry, the crucial need for this research, and specifically identifies priority research goals and key programs.

NTRI has been developed with much discussion among industry, academic, and government researchers, and fine-tuned through the recent efforts of a joint working group of industry leaders. It is the exciting result of a new alliance, proposing a new level of cooperation among industry, academia, and the federal government, for research in an area that, up until now, has not been federally supported.

Federal attention to the issues and research goals identified in NTRI is critical to the continued success of the turfgrass industry. A basic premise of NTRI is that federal research dollars should be directed toward programs which cannot be funded adequately by the states or industry, particularly for programs where the federal government can play a coordinating role not possible for any other entity. Certain research such as increased the understanding of basic biological processes is too risky or long-term for private industry to fund. Other types of research, such as environmental research, might be particularly appropriate for government support because they clearly benefit society at large.

With many programs, the Federal government can play a coordinating role which is not possible for any other entity but which is essential to ensure cooperation and maximum efficiency. Federally-funded research programs also increase the credibility of results beyond what might be afforded privately-funded programs. Finally, the

industry looks to government to fund the long-term basic research, the building blocks to which the industry applies in its own, more limited-term research efforts.

Increased federal research funding for the turfgrass industry will return benefits not only to the industry itself but also to the environment, homeowners, and athletes. NTRI will benefit rural and suburban economies across the country, increase our international competitiveness, and improve our quality of life.

How Does the Turf Initiative Work?

For NTRI to get off the ground, funding has to be appropriated by Congress. NTRI proposes $450,000 be appropriated for each research scientist position within USDA, ARS. The $450,000 is distributed as follows: $300,000 is used to hire a researcher and staff, and purchase equipment at an ARS location. The remaining $150,000 is allocated for that researcher to conduct cooperative research with universities. If NTRI is fully funded ($32.4 million), this will allow ARS to hire 72 turfgrass researchers and allocate over $10 million annually to universities through cooperative research.

NTRI will be largely implemented by research teams. These teams will frequently involve multiple research locations spread across several states to ensure the right mix of scientific skills are available for a systematic research strategy. The research dollars will be coordinated by and through the Agricultural Research Service budget. In turn, ARS will work with university and private industry researchers to establish research teams. The value of the team approach is to maximize cooperation among all of the various research communities.

The need for interdisciplinary research strategies and teams is paramount. In addressing each of the research areas suggested by NTRI, researchers must consider not only the specific goals of a project, but also how the results might impact or interact with other real-world production aspects. For example, solving a problem through biotechnology or genetic manipulation would only be useful if it does not create or exacerbate other problems encountered in producing or maintaining turfgrass in the field. None of the specific research programs in NTRI is intended to be developed in isolation.

Agricultural engineer Kevin King examines discharge water from a turfgrass system in central Ohio as part of a research program designed to assess how land uses and management affect water quality. This research is funded, in part ,by the USGA's Turfgrass and Environmental Research Program.

NTRI also envisions that research should seek to adapt results from other agriculture (or other biological) research areas, rather than starting anew for each crop or project. For example, if research is being conducted on corn or wheat that might benefit turfgrasses, then a valid research proposal would build on, rather than duplicate that research. In addition, all aspects of grassland agriculture (turf, forage, biofuels, and ecosystem restoration) will benefit from a coordi-

nated, national effort to collect, evaluate, and preserve grass germplasm. This strategy will achieve a greater return on every dollar invested in research.

Research Components of NTRI

NTRI consists of the following six broad research areas: I) water, II) germplasm, III) pests, IV) environment, V) soil, and VI) integrated turf management (ITM). Within each component are several research priorities. For instance, the critical research needs in Component I (water) are the need to improve turfgrass water use efficiency and irrigation efficiency and the need to investigate the use of recycled or saline irrigation water. The germplasm component (II) focuses on collecting valuable germplasm, developing a better understanding of the genetic systems and genes in turfgrass species, and using this material and knowledge to develop and release improved germplasm leading to improved turfgrass cultivars.

Progress to Date

So what progress has been made in getting NTRI funded? Over the last five years, we have had many meetings and contacts with ARS and USDA officials, U.S. Senators, House members, Congressional staff, even the Secretary of Agriculture. In these meetings, we have stressed the size and scope of the turfgrass industry, the important issues we face and the need for federal research dollars to solve these problems.

Thus far, our efforts have been rewarded as we have convinced the U.S. Congress to allocate funding for ARS to hire a research scientist at Beltsville, Maryland (2002), conduct cooperative research in Logan, Utah (in conjunction with Utah State University), and hire a full-time research scientist in 2006 at Beaver, West Virginia. And in the ARS budget proposed by President Bush for Fiscal Year 2007 (starting October 1, 2006), an additional $1.88 million has been allocated for turfgrass research. This additional funding, if it is still in the final budget passed by Congress later this year, will allow ARS to hire three to four researchers in the southwest U.S., and develop cooperative projects with universities, concentrating on turfgrass water use issues. For this year, we are also asking Congress to include funding for five additional research positions at four different locations.

Fiscally, the U.S. federal budget has been extremely competitive the last few years and difficult to obtain any new funding. The war in Iraq, September 11th, terrorism, biosecurity, food safety, and hurricane recovery efforts have dominated the political landscape. NTRI has, however, gotten good reviews from the U.S. Congress and subsequently some funding allocated. We are looking for larger increases for NTRI in the future.

Summary

The National Turfgrass Research Initiative (NTRI) is an ambitious, $32 million effort to take the turf industry to new heights. NTRI will solve problems related to environmental issues surrounding turf such as affecting water use and water use efficiencyand improving pest resistance and management strategies.

So what can you do to help? First, learn more about the National Turfgrass Research Initiative at:

www.turfresearch.org
or
www.turfinitiative.org.

Next contact your senators and representatives in Congress to let them know the importance of federal funding for turfgrass research by USDA, ARS. Ask them to support funding for the National Turfgrass Research Initiative.

Finally, the expense of the lobbying effort to secure NTRI funding is very high. Ask your local and state turfgrass associations and supplier companies to make a contribution to the National Turfgrass Federation, Inc. in support of this effort. The future of the turf industry is at stake! Since turfgrass is a $40 - 60 billion industry encompassing 50,000,000 acres in the U.S., we have a good case to make!

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