

APPENDIX O

ANNUAL REPORT: TURFGRASS APPROPRIATION 2001-2002

The turfgrass industry is one of the most important economic sectors in North Carolina. From recent surveys, it is estimated that managed turfgrass systems account for about 1/3 of the total agricultural acreage in the state, and turf acreage is greater than any other single commodity. The annual value of the industry is estimated to be in excess of \$4 billion.

In 2001, the General Assembly of North Carolina established a yearly appropriation of \$600,000 for turfgrass research. The purpose of the research is twofold: 1) to develop new, environmentally sound management approaches for turfgrass systems that will allow the industry to grow and remain economically sound, and 2) to develop and implement advanced outreach programs to inform the turfgrass industry and the public about developing management strategies. The General Assembly also passed a separate \$100,000 appropriation that is directed to the North Carolina Department of Agriculture to support the turfgrass outreach programs.

The current, continuing appropriations are an extension of support for turfgrass research by the N.C. Legislature. Special appropriations, targeted at resolving environmental issues, have been passed on a yearly basis since 1998. This reflects the growing economic importance of the industry and recognition that management of turfgrasses in home lawns and recreational areas impacts virtually every citizen in the state.

The turfgrass research appropriation is administered by the Center for Turfgrass Environmental Research and Education in the College of Agriculture and Life Sciences at North Carolina State University. The Center establishes research guidelines and solicits proposals from faculty at N.C. State and North Carolina Agricultural and Technical State University. The proposals are reviewed by a Board of Advisors, made up of representatives from six major sectors in the turfgrass industry and one each from N.C. State and N.C. A&T. The appropriation to NCDA is administered by that organization, but funding decisions and allocations are coordinated with the turfgrass Center and its advisory board.

For the 2001-2002 budgetary year, sixteen research and outreach proposals were submitted to the Center. Eight research and two outreach proposals were approved for funding, and two other outreach proposals were forwarded to NCDA and subsequently funded. Because of the extended legislative session, the first date the appropriated funds could be spent was March 6th, 2002. As the extent of state budget problems emerged, unspent funds were frozen on May 8th, but then restored at the end of the fiscal year. Despite the discontinuity in funding availability, substantial progress has been made. A brief overview of the research areas and accomplishments follow.

Alternative strategies for pest control. \$112,700. Numerous pesticides currently used in turfgrass management are suspected of being problematic for human health and the environment, and are being phased out by EPA regulation. These turfgrass research projects are focused on developing alternative methods of insect and disease control that reduce or eliminate chemical applications. Much of the current emphasis is on understanding the ecology of pests and establishing databases for life cycles, from which new biological control approaches can evolve. Ecological studies on three major insect pests have allowed for the more extensive use of "low risk" pesticides in a cost effective manner and the initial development of biological control pathogens for use in environmentally sensitive areas.

The research group is made up of entomologists, plant pathologists, and agronomists. Initial funding has been used for project-specific technical support, graduate student stipends, infrastructure, as activity of the field projects increase.

Fate of Nitrogen and Pesticides in the Environment. \$168,800. Water quality is a major concern in North Carolina. The purpose of these research projects is to determine the extent of surface and groundwater pollution associated with turfgrass systems, and if pollution is occurring, design management approaches to minimize the problem. Initial studies of nutrient and pesticide fate in turfgrass systems are underway. A comprehensive 3-year investigation examining the fate of nitrogen applied to golf courses has been conducted at multiple research sites in the Neuse and Cape Fear River basins in eastern North Carolina. The results have shown, conclusively, that well-managed turfgrass systems do not lead to contamination of water supplies. New sites are being established in the Piedmont and Mountain regions, to further examine the possibility of pollution in different topographies, soils, and grass types.

Additional experiments are being conducted to examine pesticide run-off and downward movement in soil profiles. Initial results indicate that herbicide breakdown is much more rapid beneath established turfgrasses than in agronomic (row crop) conditions. One overlooked aspect of turfgrass systems that appears responsible for rapid disappearance of pesticides and nutrients, is the extremely high microbial activity in the root zone. New research is examining microbial ecology and its interactions with climate variations.

Scientists working in this area include soil physicists, hydrologists, microbiologists, and turfgrass physiologists. The initial funding was used to acquire laboratory equipment for large-scale sample processing and nutrient analysis, installation of sampling wells at field sites, vehicles to extend research statewide, graduate stipends, and technical support.

Adapted Varieties. \$104,300. The use of improved, adapted varieties of turfgrass is a fundamental strategy to increase stress and disease tolerance and reduce the need for pesticides and nutrients. Two approaches are being implemented. One is to evaluate the suitability of different cool and warm season grasses for the North Carolina climate. Field tests have been established at six research field stations and several off-site locations in different parts of the state. Species being evaluated for disease, heat, and drought tolerance are tall fescue, fine fescue, Kentucky bluegrass, creeping bentgrass, centipedegrass, St. Augustinegrass, bermudagrass and zoysiagrass.

A second approach is to develop new, improved turfgrass varieties. This is being done through molecular biology research. The goal is to genetically engineer turfgrasses with increased drought and disease tolerance. Important genes have been isolated and are being tested in greenhouse and field studies.

Scientists involved in the evaluation and development of adapted turfgrass varieties are molecular biologists, plant physiologists, and turfgrass agronomists. The first year funding was used to purchase laboratory equipment (laminar flow hood, tissue culture incubator, and refrigerated microfuge), to establish multiple field sites to accommodate evaluation of a larger number of turfgrass species over the extensive climatic range in North Carolina, and for graduate student stipends.

New Environmental Research Site. \$199,200. On location, field experiments are required for understanding large-scale turfgrass/environment interactions. Many important questions, however, can only be answered in more controlled settings, where defined management treatments are sustained over many years and permanent sampling equipment can be utilized. A new turfgrass field laboratory is being established for long-term environmental studies. Appropriated funds were used for construction of experimental plots with specialized instrumentation that will provide a state of the art infrastructure for research in the years ahead.

Research projects at the turfgrass field site include key studies on nutrient and pesticide leaching and pesticide degradation patterns. In-ground lysimeters were installed for direct, continuous sampling of soil solution at various profile depths. A computer controlled irrigation system will allow establishment of drought treatments, and an extensive network of soil moisture probes will allow monitoring of plant water availability during periods of soil drying, and assessment of water uptake efficiencies in different soil zones by different turfgrass species. Such information is essential for identifying grasses that can withstand the drought conditions currently plaguing the South.

The new research field laboratory will be an important part of the turfgrass teaching and outreach programs. Graduate student projects will be located there, and the laboratory will allow undergraduate students to be exposed to advanced turfgrass research projects. As the primary site for field days and workshops, the laboratory also will showcase research projects to the turfgrass industry and the public.

Outreach. \$115,000. Extension faculty from N.C. State and N.C. A&T are developing state of the art, electronic communication systems for disseminating educational material. The material includes best management practices and the latest research results on environmentally sound management strategies. The outreach program has two components. One is the production of a web based information system. The site will be constructed primarily for group presentations like those used in master gardener and public extension meetings. With the continuous increase in turfgrass acreage with population growth, the education effort must be broad based and will allow access by industry professionals and the public. The system also will provide learning materials for a new certification program for turfgrass professionals.

A second element of the outreach initiative is development of a web site to aid in turfgrass management decisions. Through interactive programs, industry professionals and the public will have real-time access to information on cultivar selection for particular sites, identification of turfgrass diseases, insects, and weeds, along with appropriate pest management solutions. A decision aid model will allow cost comparisons within environmentally acceptable management options.

Initial funding for the outreach effort was used to purchase servers and high capacity computers and it provided salary for a computer programmer. Specialized software is being written, and the programmer is working with faculty to design the layout of the interactive programs.