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THE HARVEST MIX

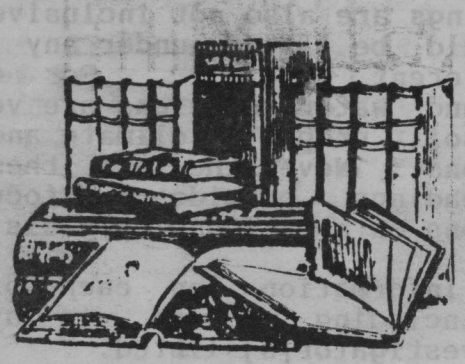
This issue of Harvests is presented as a Special Publication. It is formatted in two sections, 3A and 3B. Both sections are concerned with the identification and brief review of Turfgrass Research projects conducted throughout the United States.

During the past ten years, many questions have been asked concerning the availability of turfgrass research results on this or that topic. Why is it that we have no data available on this or that problem ? Why isn't anyone working on this or that condition ? Why doesn't turfgrass research address itself to this or that environmental issue ? Through a review of current research projects in this country, we can now offer you the means for providing authoritative answers to these question.

A REVIEW OF CURRENT TURF RESEARCH

IN THE UNITED STATES

Many gardeners and others concerned about environmental quality often are not well informed concerning the wealth of research information that helps form the basis for the culture and management of lawns and sports turf. Recommendations for proper use of fertilizers, pesticides, water and for adjusting height and frequency of cut and need for core cultivation and spiking to relieve soil compaction come in large measure from Agricultural Experiment Station research projects. Studies are conducted in nearly every state in the country so that climatic and soil variables can be taken into account.

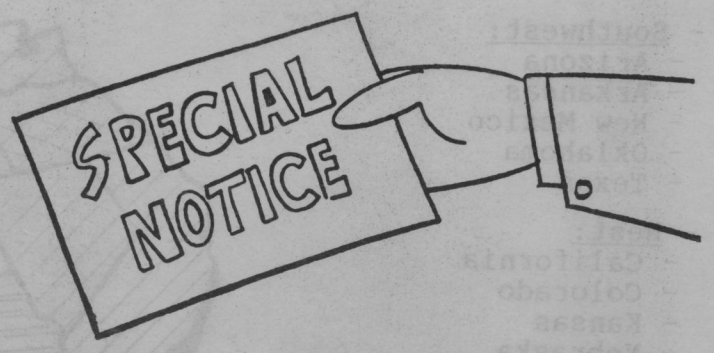


A 1989 search of the Current Research Information Service [CRIS] USDA file of agricultural research projects produced a listing of 300 entries [1]. Key words used in the identification of these entires were: turfgrass, turf, grass, lawn, golf, golf course, landscape-grass. Of these 300 projects, 269 were determined to be relevant to objectives and concerns of the overall turfgrass industry in the United States, an industry with an agri-business impact of over 30 billion dollars a year. On the basis of the average project budget being close to $50,000 a year, the total worth of these research projects would be nearly 13 and 1/2 million dollars a year. This amounts to .045% of the yearly dollar impact of the turfgrass commodity in this country. When private research is added to this public research commitment, the total research dollars would likely approach 1 % of the commodity dollar value.

A statement concerning each of these 269 projects is presented here. The following brief will help to provide an overview of what is being investigated and where the work is being conducted:

- project title
- location of research station
- investigators
- project duration - subject to extension/revision
- number
- key project objectives.

You will note that the same projects may be listed in several states and even at different branch stations within a state. Further, the same project name may be listed twice with different dates specified for the conduct of the research. This indicates a revision in the project and identifies two different progress reports, one concluding work completed and one reporting new investigations under way. Both are listed here and identified as part of the overall turfgrass research effort.



[1] The assistance of Dr Jesse Ostroff, Special Information Services, National Agricultural Library, Beltsville, Maryland is gratefully acknowledged in the conduct of this CRIS search.

The 269 projects are grouped according to location of the research station in one of 7 sections of the country:

- Northeast:
  - Connecticut
  - Delaware
  - Maine
  - Maryland
  - Massachusetts
  - New Hampshire
  - New Jersey
  - New York
  - Pennsylvania
  - Rhode Island
  - Vermont

- Transition:
  - Kentucky
  - Missouri
  - Tennessee
  - Virginia
  - West Virginia

- Southeast, Hawaii & Puerto Rico:
  - Alabama
  - Florida
  - Georgia
  - Hawaii
  - Louisiana
  - Mississippi
  - North Carolina
  - Puerto Rico
  - South Carolina

- North Central/Midwest:
  - Illinois
  - Indiana
  - Iowa
  - Michigan
  - Minnesota
  - North Dakota
  - Ohio
  - South Dakota
  - Wisconsin

- Southwest:
  - Arizona
  - Arkansas
  - New Mexico
  - Oklahoma
  - Texas

- West:
  - California
  - Colorado
  - Kansas
  - Nebraska
  - Nevada
  - Utah

- Northwest:
  - Alaska
  - Idaho
  - Montana
  - Oregon
  - Washington
  - Wyoming

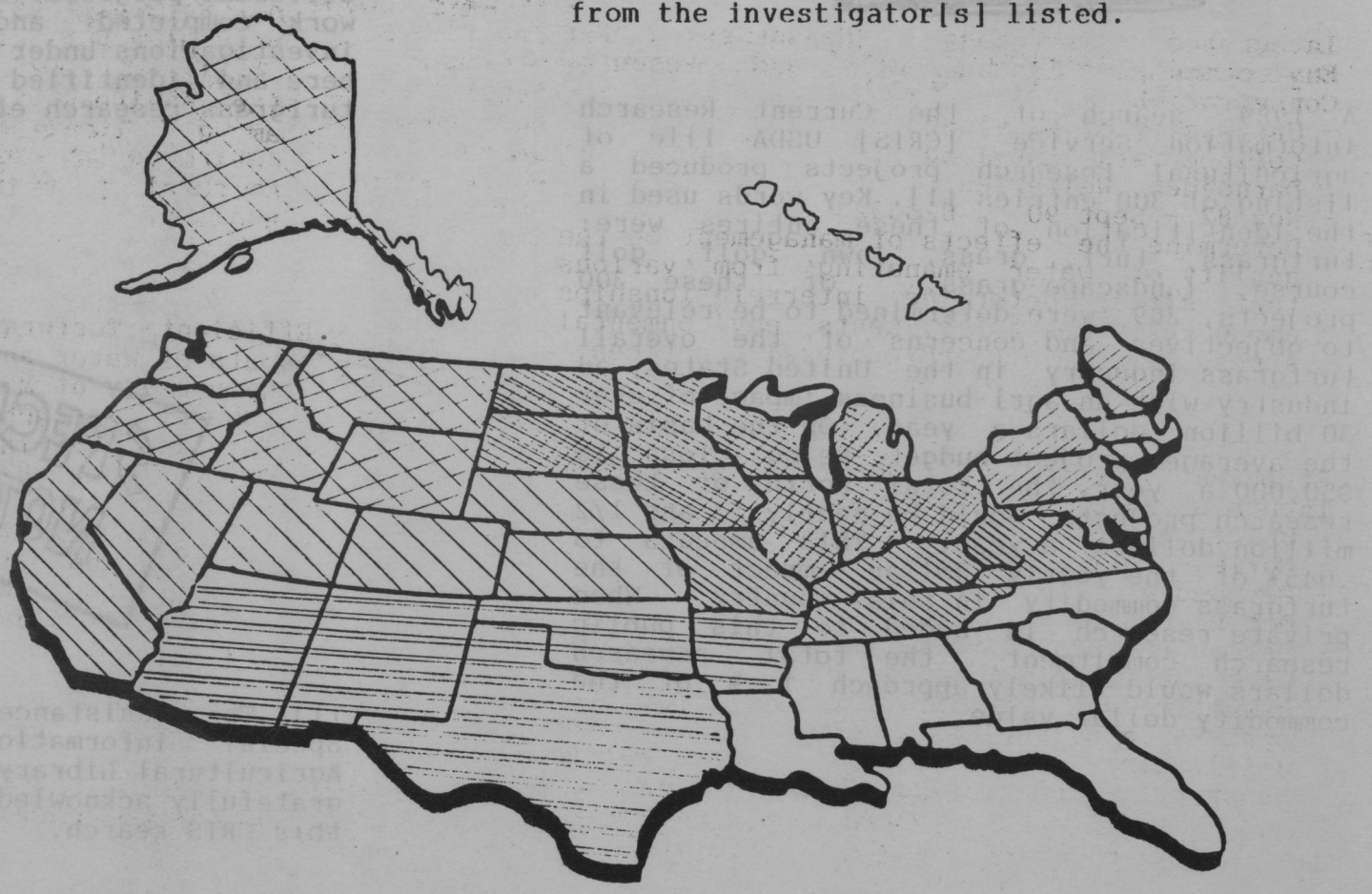
These sections were identified to group research of common interest and concern within identifiable regions. This rationale does not always hold as growth conditions within some states vary considerably depending on elevation or coastal influences. This influences research objectives and needs for research information locally.

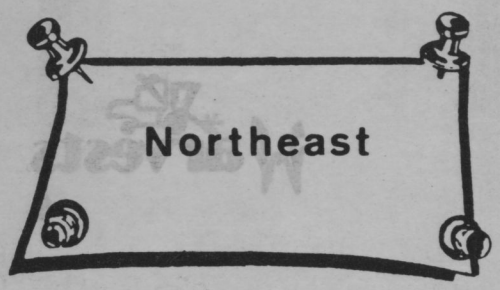
Within each section of the country projects are grouped as appropriate in the following categories:

- Cultural Practices/Cultivar Evaluations any Utilization
- Breeding and Genetics - Seed Production
- Soil Properties - Climate and Stress
- Fertilizers/Mineral Nutrition
- Irrigation/Water Relationships
- Weed Relationships/Growth Regulation
- Insect Relationships
- Disease Relationships
- Pesticides General

These groupings are also not inclusive. Many projects could be listed under any one of several different headings. For example, irrigation and water relations are very much a part of soil property, climate and stress investigations. Never-the-less, these nine research headings provide a focus for investigations on a nation-wide basis.

Additional information on each of these projects, including results, is available from the investigator[s] listed.





CULTURAL PRACTICES/CULTIVAR EVALUATIONS

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- University of Connecticut
  Storrs, Connecticut
- Dest
- Jul 83 - Sept 87 0090567
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; develop cultural systems and varieties that improve the utilization of nutrients.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- Agricultural Experiment Station
  New Haven, Connecticut
- Walton
- Jun 84 - Sept 86 0011955
- Develop cultural systems and varieties that improve the utilization of nutrients.

Integrated Turfgrass Management For Environmental Enhancement and Resource Conservation
- University of Maryland
  College Park, Maryland
- Dernoeden, Welterlen
- Nov 87 - Sept 90 0133323
- Determine the effects of management on the quality of water emanating from various turf sites; determine interrelationships among turf genotypes, pests, environmental stress, pesticides and cultural practices.

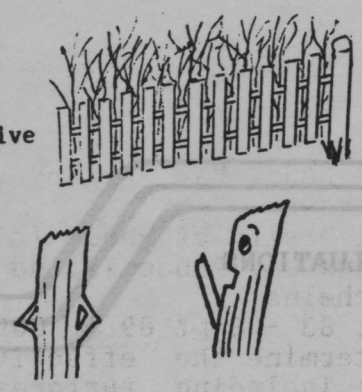
Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- University of Maryland
  College Park, Maryland
- Dernoeden
- Oct 81 - Sept 86 0086092
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; develop cultural systems and varieties that improve the utilization of nutrients; reduce energy consumption and pesticide requirements.

Integrated Management Practices and Evaluation of Grasses for Turf
- Beltsville Agricultural Research Center
  Beltsville, Maryland
- Murray, O'Neill
- Sept 79 - Mar 95 0045658
- Assess plant introductions, varieties from breeding programs and individual selections; determine merit of herbicides, fungicides and insecticides on establishment, renovation and maintenance; determine feasibility of utilizing composed sewage sludge for turfgrass production.

Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- University of Massachusetts
  Amherst, Massachusetts
- Bhowmik, Cooper, Torello
- Oct 87 - Sept 92 0133642
- Determine the effects of pesticides and fertilizer application on the quality of the environment; determine relationships among turfgrass genotypes, pests, environmental stresses, pesticides and cultural practices which enhance turf quality.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- University of Massachusetts
  Amherst, Massachusetts
- Torello, Bhowmik, Cooper
- Oct 81 - Sept 87 0085948
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; improve utilization of nutrients; reduce energy consumption; reduce pesticide requirements.

That gardener is just too permissive with his grass !



Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- Pennsylvania State University
  University Park, Pennsylvania
- Watschke, Waddington, Heller
- Oct 87 - Sept 92 0133474
- Determine effects of management on the quality of water emanating from various turf sites; determine interrelationships among turf genotypes, pests, environmental stresses, pesticides and cultural practices.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- Pennsylvania State University
  University Park, Pennsylvania
- Duich, Watschke
- Oct 81 - Sept 87 0082277
- Evaluate drought tolerance of turfgrass species under minimum maintenance conditions; determine nutrient uptake of selected cultivars and the impact of soil amendments and growth retardants on performance.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- Rutgers University
  New Brunswick, New Jersey
- Funk
- Oct 81 - Sept 86 0086091
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; improve utilization of nutrients; reduce energy consumption; reduce pesticides requirements.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- Rutgers University
  New Brunswick, New Jersey
- Duell
- Oct 81 - Sept 87 0086882
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; develop cultural systems and varieties that improve utilization of nutrients; develop management systems that reduce energy consumption.

Minimum Maintenance Cover on Problem Sites in New Jersey
- Rutgers University
  New Brunswick, New Jersey
- Duell
- Jan 84 - Dec 91 0031839
- Elucidate and evaluate the nature and magnitude of factors affecting the establishment and maintenance of appropriate vegetative cover for problem sites in New Jersey.

Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- Rutgers University
  New Brunswick, New Jersey
- Duell, Funk, White
- Oct 87 - Sept 92 0134278
- Determine the interrelationships among turf genotypes, pests, environmental stresses, pesticides and cultural practices that enhance turf management; study the role of endophytic fungi in modifying turfgrass performance.

Contribution of the Agricultural and Food Industry to the New Jersey Economy
- Rutgers University
  New Brunswick, New Jersey
- Adelaja
- Oct 86 - Dec 87 0130146
- Estimate the value of production, value added and employment generated in each sector of the food and agricultural industry; show the relative importance of major subsectors and to determine the causes of growth in employment, value added and production.

Integrated Turfgrass Management For Environmental Enhancement and Resource Conservation
- Cornell University
  Ithaca, New York
- Petrovic, Hummel, Neal
- Oct 87 - Sept 92 0134148
- Determine the effects of management on the quality of water emanating from various turf sites; determine the interrelationships among environmental stresses, herbicides and cultural practices that enhance turf management.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- Cornell University
  Ithaca, New York
- Petrovic, Smiley, Tashiro
- Oct 81 - Sept 86 0086038
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; improve utilization of nutrients, reduce pesticide requirements.

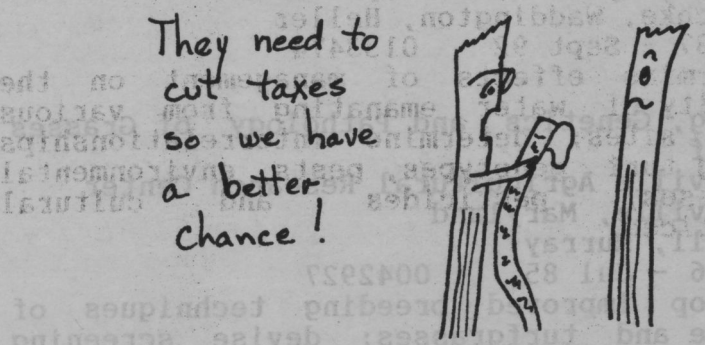
Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- New York Agricultural Experiment Station
  Geneva, New York
- Tashiro, Petrovic
- Oct 81 - Dec 85 0086930
- Develop cultural systems and varieties that reduce pesticide requirements; determine populations of insects present and evaluate condition of cultivars in relation to insect feeding.

Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- New York Agricultural Experiment Station
  Geneva, New York
- Villani
- Oct 87 - Sept 92 0134150
- Determine the interrelationships among turf genotypes, pests, environmental stresses, pesticides, and cultural practices that enhance turf management.

Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- University of Rhode Island
  Kingston, Rhode Island
- Skogley, Jackson, Duff
- Oct 87 - Sept 92 0133896
- Determine the effects of management on the quality of water emanating from various turf sites; determine the interrelationships among turf genotypes, pests, environmental stresses, pesticides and cultural practices.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- University of Rhode Island
  Kingston, Rhode Island
- Skogley, Jagschitz
- Oct 81 - Sept 87 0082992
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; improve utilization of nutrients; reduce energy consumption; reduce pesticide requirements.

Rural Land Use, Policy and Taxation in the Northeast
- University of Rhode Island
  Kingston, Rhode Island
- Wichelns
- Oct 83 - Sept 89 0091855
- Determine the effectiveness of rural land use including turfgrass sod production and tax policies which affect the retention of farmland and open space; determine the magnitude and distribution of social costs and benefits of these rural land use and taxation policies.



BREEDING AND GENETICS

- SEED PRODUCTION

Seed Testing
- Agricultural Experiment Station
  New Haven, Connecticut
- Walton
- Jan 71 - Jan 99 0009530
- Test the quality of seeds offered for sale in Connecticut; run germination tests on vegetable and field seeds, including mixtures of grass seeds for lawns which will also be tested for purity.

Electrophoretic and Morphological Studies of the Genus Zoysia
- University of Maryland
  College Park, Maryland
- Murray, Welterlen
- Aug 85 - July 86 0140232
- Isolate and identify isozymes and morphological traits for the purpose of using them as genetic markers in an interspecific hybridization breeding program.

Enhancement of Germplasm and Assessment Techniques of Grasses for Turf
- Beltsville Agriculture Research Center
  Beltsville, Maryland
- Murray
- Apr 86 - Mar 91 0141344
- Assemble and exploit plant genetic potentials; locate types requiring less input of resources; identify genetic markers, concepts and techniques for improving Poa, Festuca and zoysia.

Breeding, Genetics and Pathology of Grasses for Turf
- Beltsville Agricultural Research Center
  Beltsville, Maryland
- O'Neill, Murray
- Jan 76 - Jul 85 0042927
- Develop improved breeding techniques of forage and turfgrasses; devise screening methods for incorporation of superior quality and agronomic traits; release improved germplasm; develop procedures for controlling diseases in the transition zone; isolate sources of resistance.

The Development Techniques for the Improvement of Turfgrasses by Tissue Culture
- University of Massachusetts
  Amherst, Massachusetts
- Torello
- Oct 82 - Sept 87 0088897
- Investigate hormonal requirements and environmental parameters for plantlet regeneration and suspension cultures; induce and select cellular variations which exhibit tolerances to heat, cold and salts.

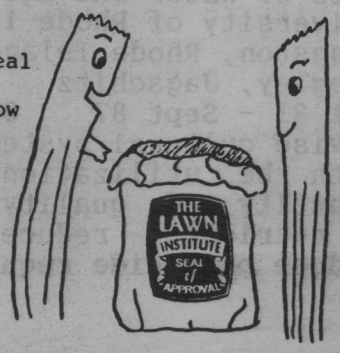
Breeding and Evaluation of Turfgrasses
- Rutgers University
  New Brunswick, New Jersey
- Funk
- Jun 87 - Sept 91 0002989
- Maintain and monitor cultivars developed, enhance quality seed production; collect, preserve and enhance germplasm; evaluate turfgrasses and develop more efficient germplasm screening and evaluation techniques; improve the procedures and techniques for more effective genetic improvement.

Biology of Fungal Endophytes Associated with Turfgrass
- Rutgers University
  New Brunswick, New Jersey
- Halisky, Clarke
- Oct 84 - Sept 89 0012198
- Develop methods of staining the fungal endophyte to facilitate screening of grass seeds and seedlings; isolate and culture the endophyte; develop inoculation techniques; determine distribution in grass hosts; investigate response of infected plants with other pathogens.

Turfgrass Breeding
- Pennsylvania State University
  University Park, Pennsylvania
- Duich
- Jul 82 - Jun 87 0085315
- Expand germplasm resources and develop improved cultivars for turfgrass use within the genus Agrostis, Festuca, Lolium and Poa.

Turfgrass Breeding and Evaluation
- Pennsylvania State University
  University Park, Pennsylvania
- Duich, Nelson
- Jul 87 - Jun 92 0131932
- Develop improved cultivars of turfgrasses for lawns and recreational use and evaluate characteristics which determine turfgrass quality.

Maintenance and Production of Seed Stocks of Agronomic and Horticultural Crops
- Pennsylvania State University
  University Park, Pennsylvania
- McKee
- Jul 67 - Jun 87 0027620
- Maintain essential supplies of basic seed stocks of varieties of agronomic and horticultural crops originated in the research programs of the Pennsylvania Agricultural Experiment Station including turfgrasses.

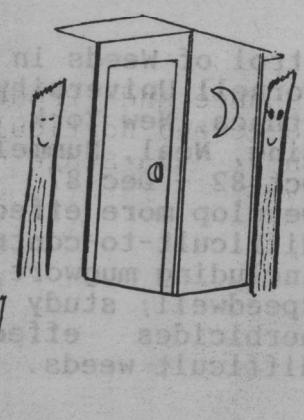


SOIL PROPERTIES - CLIMATE AND STRESS

Culture and Adaptation of Turfgrasses to Environmental Stress
- University of Maryland
  College Park, Maryland
- Welterlen, Dernoeden
- Oct 83 - Sept 86 0091207
- Evaluate cultivar and species response to environmental stresses; determine effects of cultural practices on stress tolerance of turfgrasses to investigate methods to reduce environmental stress.

FERTILIZERS/ MINERAL NUTRITION

Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- University of Connecticut
  Storrs, Connecticut
- Dest
- Oct 87 - Sept 92 0136255
- Develop efficient, effective, environmentally compatible fertilization practices.



The Effects of Slow Release Nitrogen Sources on Nitrate Leaching From Late Fall Applications to Turf
- Cornell University
  Ithaca, New York
- Petrovic
- Jan 89 - Sept 92 0093898
- Determine the extent of nitrate leaching from turfgrass sites receiving slow release nitrogen sources in the late fall period.

Micronutrient Nutrition of Creeping Bentgrass Grown on Sand Based Media
- Cornell University
  Ithaca, New York
- Hummel, Davidson
- Dec 88 - Sept 91 0136998
- Determine need for manganese applications for bentgrass grown at different fertility levels on two sand types.

Soil Test Calibration Studies for Turfgrass
- Cornell University
  Ithaca, New York
- Hummel, Petrovic
- Oct 84 - Sept 88 0093915
- Evaluate and correlate soil test results of three analytical methods to turfgrass response in the field; determine the best analytical soil test method and to develop a set of fertilizer recommendations for that method.

Fertilization and Soil Properties on Turfgrass Areas
- Pennsylvania State University
  University Park, Pennsylvania
- Waddinton, Duich, Watschke
- Jul 85 - Jun 90 0095415
- Determine nitrogen availability and release rate; determine interrelationships between applied fertilizer, soil test results and turfgrass response; determine the effect of management practices on soil physical properties of turf areas.

Quality Turf: Substitution of Iron for Nitrogen: Identification of Grasses Requiring Less Fertilizer
- University of Rhode Island
  Kingston, Rhode Island
- Duff, Hull, Skogley
- Oct 85 - Sept 90 0096051
- Investigate turf management strategies leading to production of acceptable quality turf at lower than historic levels of input.

Factors Governing the Efficiency of Nutrient and Water Use by Turfgrasses
- University of Rhode Island
  Kingston, Rhode Island
- Hull, Gold, Skogley
- Oct 85 - Sept 90 0096123
- Identify characteristics of turfgrass species which contribute to efficient water use; identify properties which contribute to more efficient nutrient use; construct a comprehensive nitrogen flux model for closely mowed Kentucky bluegrass turf.

WEED RELATIONSHIPS/GROWTH REGULATION

Weed Control Strategies for Ornamentals, Small Fruits, Orchards and Landscapes
- Agricultural Experiment Station
  New Haven, Connecticut
- Ahrens
- Oct 86 - Sept 91 0130824
- Investigate effects of long-term use of herbicides; investigate herbicide penetration and persistence in the soil profile; investigate how to reduce quantity of herbicide required; investigate methods for control of troublesome weeds.

Weed Control Technology for Ornamental Crops
- Valley Agricultural Experiment Station Laboratory, Windsor, Connecticut
- Ahrens, Frank
- Mar 87 - July 98 0141895
- Evaluate herbicides for their effectiveness and phytotoxicity under field conditions.

Isolate and Identify New Natural and Synthetic Plant Growth Regulating Substances
- Beltsville Agricultural Research Center
  Beltsville, Maryland
- Buta, Mandava
- Jan 74 - Jul 85 0040792
- Isolate and identify new natural and synthetic biologically active plant growth regulating substances with emphasis on those released by plants into the environment which improve the growth of other plants or organisms or cause alleopathic effects on plants including turfgrasses.

Endogenous Growth Regulators Associated With Allelochemical Interactions in Turfgrasses and Dwarfing Fruit Trees
- Beltsville Agricultural Research Center
  Beltsville, Maryland
- Buta, Reed, Anderson
- Jul 85 - Jul 90 0140146
- Identification of endogenous growth regulators having allelochemical effects on germination and early seedling growth.

Weed Control in Field Crops and Turfgrasses
- University of Massachusetts
  Amherst, Massachusetts
- Bhowmik, Marsh
- Oct 84 - Sept 89 0094136
- Develop weed control methods for turfgrasses and field crops by establishing efficacy, crop and turf tolerance and residue data under Massachusetts conditions; identify the combinations of factors that contribute to weed suppression in field crops and lawn turf.

Factors Affecting Turfgrass Herbicide Efficiency
- Rutgers University
  New Brunswick, New Jersey
- Engel
- Jan 59 - Dec 84 0004343
- Determine effects of herbicides on seed and seedlings and on turfgrass plants; evaluate the chemical and physical management factors to determine if they are damaged or enhanced by the performance of several turfgrass preemergence herbicides.

Control of Weeds in Turfgrass
- Cornell University
  Ithaca, New York
- Bing, Neal, Hummel
- Oct 82 - Dec 87 0073724
- Develop more effective controls for several difficult-to-control turfgrass weeds including mugwort, yellow wood sorrel and speedwell; study the safety of turfgrass herbicides effective on these more difficult weeds.

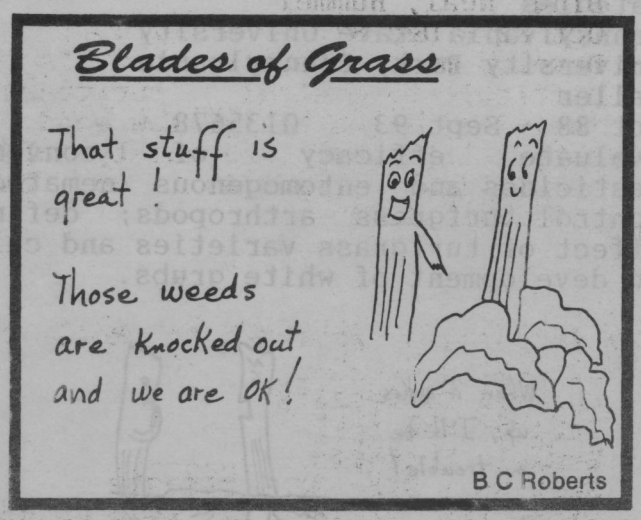
An Integrated Approach to Moss Control in Golf Course Greens
- Cornell University
  Ithaca, New York
- Hummel, Petrovic
- Sept 85 - Sept 86 0097210
- Study the ecology of moss on golf greens; develop management practices that prevent moss encroachment.

INSECT RELATIONSHIPS

Weed Control in Turfgrass and Ornamentals
- Cornell University
  Ithaca, New York
- Neal, Senesac
- Oct 86 - Sept 89 0099576
- Investigate methods for improved weed control; evaluate influence of herbicide application timing; evaluate spray adjuvant effect on herbicide efficacy and phytotoxicity; investigate species and varietal differences in herbicide phytotoxicity.

Turfgrass Weed Control and Growth Retardation
- Pennsylvania State University
  University Park, Pennsylvania
- Watschke, Waddington, Duich
- Jul 85 - Jun 90 0095593
- Evaluate pre- and post-emergence herbicides; determine most effective rates and application timing for various growth retardants; assess effects of various adjuvants on activity of different herbicides and growth retardants; determine morphological and physiological effects of growth retardants.

Early Season Sub-solum Losses of Atrazine in Southern New England
- University of Rhode Island
  Kingston, Rhode Island
- Sullivan, Gold
- May 83 - Apr 87 0090214
- Determine the efficacy of limited herbicide application in removing undesired vegetation; compare and contrast the herbicide program with other reclamation schemes; monitor surface runoff and groundwater leachate from turfgrass.

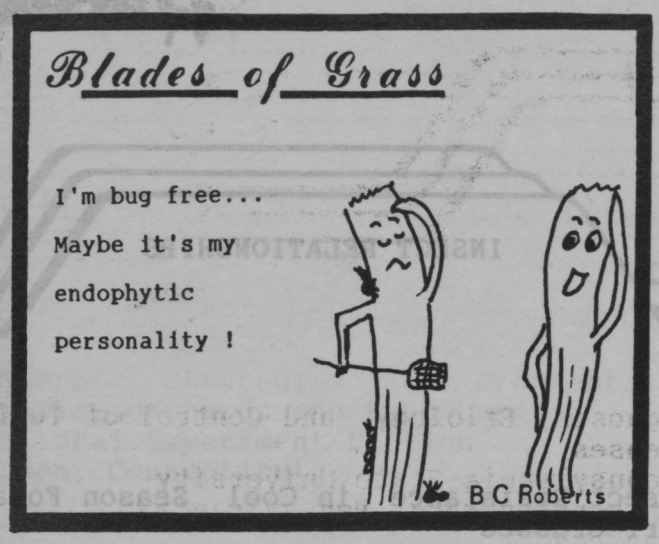


Insect Resistance in Cool Season Forage and Turf Grasses
- University of Maryland
  College Park, Maryland
- Ratcliffe
- Mar 78 - Sept 85 0044364
- Evaluate cool season grasses for resistance to insect pests including the hairy chinch bug and sod webworms; develop in cooperation with plant breeders, multiple pest resistant lines or cultivars; obtain information on the abundance and seasonal distribution of major grass insect pests.

Insect Resistance in Alfalfa, Cool Season Forage and Turfgrasses and Soybeans
- Beltsville Agricultural Research Center
  Beltsville, Maryland
- Elden, Ratcliffe
- Mar 86 - Jun 89 0140792
- Determine greenbug biotype x plant resistance interaction in Kentucky bluegrass and interaction of endophytic fungi and chinch bug resistance.

Systematics, Morphology and Identification of Cyst, Root-Knot and Related Plant Nematodes
- Beltsville Agricultural Research Center
  Beltsville, Maryland
- Golden
- Apr 85 - Apr 90 0049385
- Develop new data and information on the systematics, morphology and identification of plant nematodes; develop the taxonomic resources necessary for conducting this research; provide a sound basis for testing turfgrasses for resistance to individual species.

Biology and Control of Turf Insect Pests
- University of Massachusetts
  Waltham, Massachusetts
- Vittum, Troll
- Mar 82 - Sept 88 0087062
- Determine the biology of annual bluegrass weevil and black turfgrass Ataenius in Massachusetts; determine a practical procedure to predict insect activity; develop a method of predicting whether an insect population is likely to cause unacceptable damage.



Insect-Host Interactions in Endophyte Infected Turf Grass
- Rutgers University
  New Brunswick, New Jersey
- Streu
- Jan 88 - Sept 90 0134132
- Determine if infection by fungal endophytes in various fine fescue turfgrasses enhance resistance to specific insects and to determine if endophyte enhanced resistance changes with temperature.

Using Billbug Taxonomy Distribution and Plant Host Information to Optimize Turfgrass Breeding Programs
- Rutgers University
  New Brunswick, New Jersey
- Wolfe, Johnson-Cicalese
- Aug 87 - Jun 92 0132488
- Discover the number of Sphenophorus in the northeast; determine the number of species that are pests; associate and taxonomically study immature stages with emphasis on pest species; begin biochemical and karyological studies of species complexes.

A Selected Survey of the Insects of New Jersey
- Rutgers University
  New Brunswick, New Jersey
- Wolfe, May
- Aug 82 - Dec 87 0088339
- Conduct a carefully planned, selected survey of insect fauna of New Jersey with emphasis on economic insects; provide a respository for voucher specimens; prepare an identification manual.

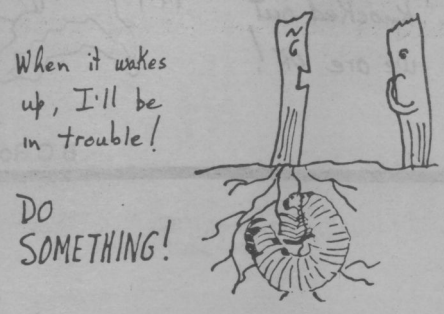
Biology and Control of Turf Insects
- New York Agriculture Experiment Station
  Geneva, New York
- Tashiro, Straub
- Jan 70 - Dec 85 0056903
- Determine biology/bionomics of turf insects and develop methods for control/management of their populations to prevent damage to turf.

Impact of Soil Physical Properties on White Grub Behavior
- New York Agricultural Experiment Station
  Geneva, New York
- Villani
- Jul 87 - Sept 92 0132109
- Determine the species-specific response of the turfgrass-inhabiting white grub complex to soil physical properties in an effort to develop more efficient and effective management strategies.

Interactions of Soil Insects, Control Agents and the Environment in Turf Systems
- New York Agriculture Experiment Station
  Geneva, New York
- Villani
- Jan 86 - Dec 90 0097722
- Evaluate independently and in combination chemical and biological insecticides, nematodes and microbials for efficacy against soil pests; monitor the interaction of target species, control agents and the soil environment.

Control and Economics of Turfgrass Insect Pests
- Pennsylvania State University
  University Park, Pennsylvania
- Heller
- May 83 - Sept 88 0089970
- Determine and assess the economic impact of turfgrass pests in Pennsylvania; test the effectiveness of insecticides against turfgrass pests; examine the effects of turfgrass maintenance practices on the biomics of turfgrass pests.

Management of Turfgrass Arthropods With Conventional and Biorational Pesticide Strategies
- Pennsylvania State University
  University Park, Pennsylvania
- Heller
- Oct 88 - Sept 93 0135678
- Evaluate efficacy of conventional pesticides and entomogenous nematodes to control turfgrass arthropods; define the effect of turfgrass varieties and cultivars on development of white grubs.



DISEASE RELATIONSHIPS

Disease Survey of Connecticut
- New Haven Experiment Station
  New Haven, Connecticut
- Walton
- Oct 69 - Jan 99 0056028
- Survey disease in Connecticut; note and report appearance of new diseases and outbreaks of diseases of unusual severity including those on turfgrasses.

Resistance to Fungal and Mite Diseases of Turfgrasses and Anthracnose of Alfalfa
- Beltsville Agricultural Research Center
  Beltsville, Maryland
- O'Neill
- Apr 86 - Mar 89 0141167
- Investigate the physiological and biochemical basis for recognition and induced resistance of mite diseases.

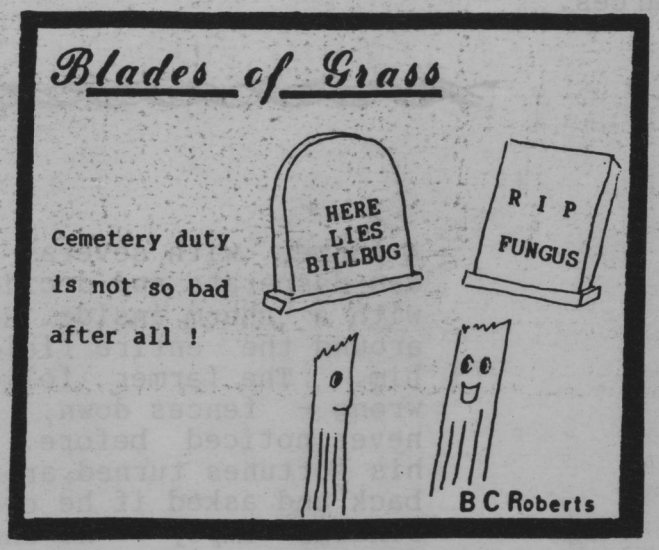
Identity and Biology of Poisonous Mushrooms and Micro-Fungi: Development of National Fungus Collections
- Beltsville Agriculture Research Center
  Beltsville, Maryland
- Rossman, Farr
- Sept 77 - Sept 85 0044012
- Acquire taxonomic and biological data on mushrooms of Washington, DC area and the United States emphasizing poisonous and lawn fungi; develop National Fungus collections as basic component of research in fungal systematics.

Ecology and Control of Root-Infecting Pathogens of Turfgrass in New York State
- Cornell University
  Ithaca, New York
- Nelson
- Aug 87 - Sept 90 0132417
- Determine the occurrence, pathogenicity and pesticide sensitivity of Phythium and Rhizoctonia species; determine biotic and abiotic factors influencing population dynamics; evaluate biological control agents; determine environmental and soil edaphic factors in biological control.

Diagnosis, Etiology and Control of Turfgrass Diseases
- Pennsylvania State University
  University Park, Pennsylvania
- Sanders
- Sept 87 - Jun 92 0132447
- Determine which turfgrass diseases cause diagnostic problems and develop aids for diagnosis, test fungicides for control; determine the dynamics of Pythium aphanidermatum populations.

Diagnosis, Control and Etiology of Turfgrass Diseases
- Pennsylvania State University
  University Park, Pennsylvania
- Sanders, Cole
- Jul 82 - Sept 87 0085308
- Determine which turfgrass diseases present diagnostic problems in Pennsylvania; develop, test and promulgate diagnostic systems and aids; test fungicides for control of turfgrass disease; investigate etiology of Fusarium blight.

Turfgrass Diseases Their Cause, Epidemiology and Control
- University of Rhode Island
  Kingston, Rhode Island
- Jackson
- Oct 85 - Sept 90 0095880
- Determine the identity and significance of dematiaceous ectotrophic fungi present on roots and crowns; investigate Collectotrichum graminicola and its role in anthracnose/root and crown rot diseases; investigate plant growth retardant and fungal disease interactions.



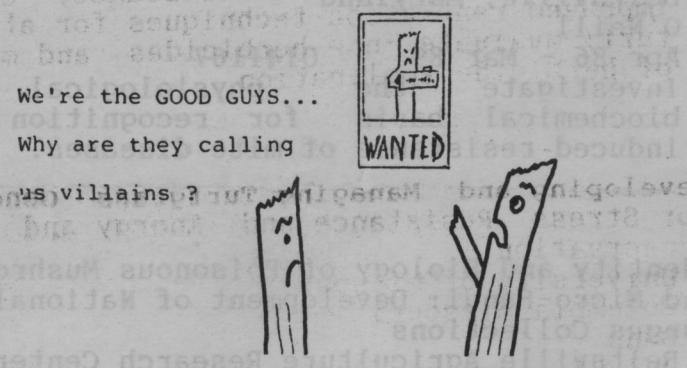
PESTICIDES - GENERAL

Implications of Pesticide Residue Dynamics to Human Exposure
- University of Massachusetts
  Amherst, Massachusetts
- Jenkins
- May 88 - Sept 92 0134724
- Residue dynamics on turf relative to human exposure is being characterized following application of selected pesticides according to practices typical of the Northeast; risk associated with occupational or inadvertent exposure is being evaluated.

Opinions About Pesticides and Related Environmental Issues: A Study of New York Adults
- Cornell University
  Ithaca, New York
- Yarbrough
- Dec 84 - Aug 86 0095537
- Explore the nature of public opinion about pesticides and their uses; examine linkages between these opinions and opinions regarding more general environmental issues.

Assessment and Control of Nonpoint Source Groundwater Pollution
- University of Rhode Island
  Kingston, Rhode Island
- Gold, Felbeck, Groffman
- Oct 88 - Sept 93 0135445
- Quantify and rank the nitrate-nitrogen flux to groundwater from rural and suburban land uses; develop management practices to minimize nitrate pollution from non-point sources.

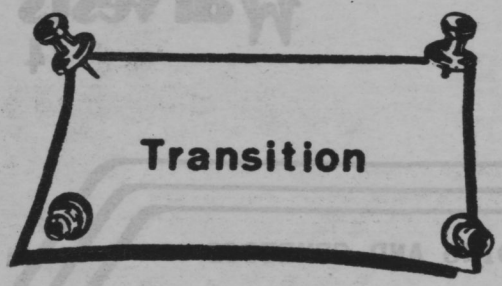
Assessment and Reduction of Nonpoint Waterborne Pollutants
- University of Rhode Island
  Kingston, Rhode Island
- Gold, Sullivan
- Oct 84 - Sept 88 0093401
- Create a field laboratory to monitor surface and runoff and subsurface leachate; evaluate the waterborne contaminants discharged from various home lawn management systems; assess the waterborne contaminants from conservation and conventionally tilled croplands.



Uniformity of Pesticide Distribution With Irrigation System Application
- University of Rhode Island
  Kingston, Rhode Island
- Sullivan
- Jan 87 - Jun 88 0133404
- Determine potential problems with the homogenity of pesticide distribution applied under diverse conditions from fixed overhead and traveling gun type sprinkler irrigation systems.

PARABLE

A farmer with several hundred acres couldn't seem to make any money. He was desperate and decided to contact a leprechaun who gave the farmer a box with a charm inside. He told the farmer to take it to each field and walk around the entire field with it and at the end of one year, return it to him. The farmer followed the directions and at each field found things wrong - fences down, a helper sleeping, and all sorts of problems he had never noticed before. As he saw these situations, he corrected them and his fortunes turned around. At the end of the year the farmer took the box back and asked if he could purchase the charm. The leprechaun told him the box was empty - no charm. The farmer had paid attention to details and that made a difference.



CULTURAL PRACTICES/CULTIVAR EVALUATIONS

Evaluation of Improved Turfgrass Cultivars and Management Techniques for Use in Kentucky
- University of Kentucky
  Lexington, Kentucky
- Powell
- Nov 86 - Sept 91 0130384
- Evaluate new turfgrass cultivars for improved winter hardiness, drought tolerance and pest resistance; develop improved renovation techniques for athletic turf; evaluate new herbicides and methods of herbicide application

Developing and Managing Turfgrass Genotypes for Stress Resistance and Energy and Water Conservation
- University of Missouri
  Columbia Missouri
- Dunn
- Jul 85 - Jun 90 0057246
- Develop improved cool and warm season grasses for the transition environment through breeding and selection; establish and manage selected species and/or varieties for best adaptation; conserve energy and water in turf culture.

Developing and Managing Turfgrasses in Missouri - A Transition Zone State
- University of Missouri
  Columbia, Missouri
- Minner
- Jul 85 - Jun 90 0095492
- Determine suitability of cool season grasses in the transitional climates with emphasis on low maintenance; develop irrigation scheduling and water conservation programs.

Evaluation of New Cultivars, Culture and Mechanical Practices in Turfgrass
- University of Tennessee
  Knoxville, Tennessee
- Callahan
- Oct 80 - Sept 86 0082770
- Evaluate cool and warm season turf cultivars under different environmental conditions in Tennessee; identify crystalline mineral materials in sands for root zone mixes and refine procedures to identify temperature, weight loss and destruction.

Cultivars, Cultural and Mechanical Practices Evaluations in Turfgrass
- University of Tennessee
  Knoxville, Tennessee
- Callahan
- Oct 85 - Sept 90 0096247
- Evaluate cool and warm season cultivars for adaptation in Tennessee; study influence of specific nutrients on improving leaf stress tolerance; study effectiveness of different types of barrier specifications between porous root zones and gravel sub-drains; evaluate new methods for thatch control.

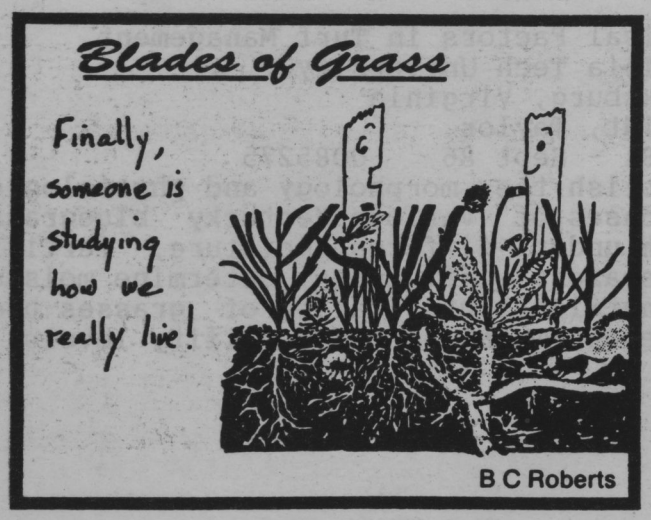
Ecological Factors in Turf Management
- Virginia Tech University
  Blacksburg, Virginia
- Schmidt, Taylor
- Oct 81 - Sept 86 0085275
- Establish the morphology and physiological responses of various Kentucky bluegrasses grown under different moisture, fertility and seasonal influences; determine moisture and nutrient utilization of grasses under different moisture and fertility levels.

BREEDING AND GENETICS
- SEED PRODUCTION

Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- Virginia Tech University
  Blacksburg, Virginia
- Schmidt
- Oct 87 - Sept 92 0134065
- Determine the interrelationships among turf genotypes, pests, environmental stresses, pesticides and cultural practices that enhance turf management.

Efficient Turfgrass Culture With Limited Inputs of Water and Energy
- Virginia Tech University
  Blacksburg, Virginia
- Taylor, Schmidt
- Oct 81 - Sept 87 0086088
- Devise cultural systems that are compatible with the utilization of water of varied quantity and quality; improve utilization of nutrients and reduce energy consumption.

Integrated Turfgrass Management for Environmental Enhancement and Resource Conservation
- West Virginia University
  Morgantown, West Virginia
- Weaver
- Oct 87 - Sept 92 0133606
- Determine interrelationships among turf genotypes, pests, environmental stresses, pesticides and cultural practices that enhance turf management.



Breeding and Improvement of Cool-Season Grasses for Turf Use
- University of Kentucky
  Lexington, Kentucky
- Buckner, Burrus
- Jul 75 - Sept 87 0068352
- Breed genetic populations of Festuca with increased disease and insect resistance, tolerance to environmental stress, aesthetic value and agronomic characteristics; improve performance and aesthetic value of other cool-season species through evaluation of management practices.

Plant-fungal Endophyte Interactions: In Species of Festuca and Lolium
- University of Kentucky
  Lexington, Kentucky
- Siegel, Bush, Dahlman
- Oct 86 - Sept 91 0099400
- Characterize the factors responsible for disease resistance in endophyte infected grasses; determine the effects of specific contributions of species of grasses and fungal endophytes on expression and regulation of pest resistance.

Endophytic Fungi: Harmful and Beneficial Effects on Forage and Turf Grasses
- University of Kentucky
  Lexington, Kentucky
- Siegal, Bush, Dahlman
- Jun 85 - Sept 87 0098601
- Examine the effect of endophytic fungi on the expression of plant growth and development; determine the effect of specific combinations of grass and fungus species on the expression of disease symptoms and presence of the fungus in seed.

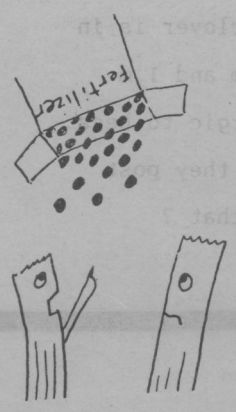
SOIL PROPERTIES
- CLIMATE AND STRESS

The Infection of Grass Leaves by Restricted and Common Primary Saprophyilic Phylloplane Microflora
- Virginia Tech University
  Blacksburg, Virginia
- Couch
- July 89 - Jun 94 0138117
- Determine the impact of stresses on chemical composition of leaf surfaces and acceleration of senescence of creeping bentgrass, Kentucky bluegrasss and annual bluegrass; study histopathology of infection.

FERTILIZERS
/MINERAL NUTRITION

Influence of Exogenous Iron and Cytokinins on Turf Development and Physiology
- Virginia Tech University
  Blacksburg, Virginia
- Schmidt
- Apr 87 - Mar 92 0130784
- Determine the influence of exogenous iron and cytokinins on morphological development, photosynthesis, respiration and chlorophyll activity; study fall response and recovery from dormancy in the spring.

I hope it's all "natural."



WEED RELATIONSHIPS
/GROWTH REGULATION

Weed Propagule Reduction in Soil by Microorganisms
- Agricultural Research Service
  Columbia, Missouri
- Kremer
- Sept 85 - Aug 90 0140478
- Identify microorganisms, antimicrobial chemicals and other factors in weed propagules and soils to provide bases for developing methods of effectively manipulating weed propagule behavior in soil.

Altering the Impact of Environmental Stress on Fruit Crop Survival
- University of Missouri
  Columbia, Missouri
- Warmund
- Jul 84 - Sept 89 0093133
- Investigate several herbicides and growth regulators on various turfgrass cover crops to reduce mowing frequency and aid in the management of soil water; determine effects of turfgrass growth regulators on growth of associated fruit crops.

Pesticide Evaluations and Their Effects o Turfgrass
- University of Tennessee
  Knoxville, Tennessee
- Callahan
- Oct 80 - Sept 86 0082771
- Determine effectiveness of newer herbicides; evaluate variable rates, frequencies and timing; determine anatomical and morphological effects of newer pesticides in roots of turfgrasses.

Evaluations of Pesticides for Pest Control and Phytotoxicity in Turfgrass
- University of Tennessee
  Knoxville, Tennessee
- Callahan
- Oct 85 - Sept 90 0096333
- Evaluate effectiveness of newer herbicides; study variable rates and frequencies of application; determine anatomical and morphological cellular sites in turf plants that are affected by pesticides.

Interaction of Plant Growth Regulators on Turfgrass and Weed Suppression
- Virginia Tech University
  Blacksburg, Virginia
- Bingham
- Jan 88 - Dec 92 0133668
- Determine the influence of imazapyr on the amount of translocation, metabolism and plant growth regulator activity of imazethapyr in tall fescue and compare with yellow nutsedge.

Translocation and Metabolism of Oxadiazon, Bentazon and Related Herbicides in Plants
- Virginia Tech University
  Blacksburg, Virginia
- Bingham
- Sept 81 - Aug 87 0084705
- Determine the amount of translocation of oxadiazon, bentazon and related herbicides in Kentucky bluegrass and evaluate the influence of rate of translocation and metabolism on selectivity between several species.

Develop Weed Control Practices for Perennial Horticultural Crops
- Agricultural Research Service
  Kearneysville, West Virginia
- Welker
- Apr 80 -- Mar 86 0046081
- Develop new and improved weed control technology for use in perennial horticultural crops, reduce losses in yield and quality and reduce cost of control; investigate use of grass sod for controlling weeds, preventing herbicide injury to crops, reducing residues in soils and preventing hazards to the air and water environment.

INSECT RELATIONSHIPS

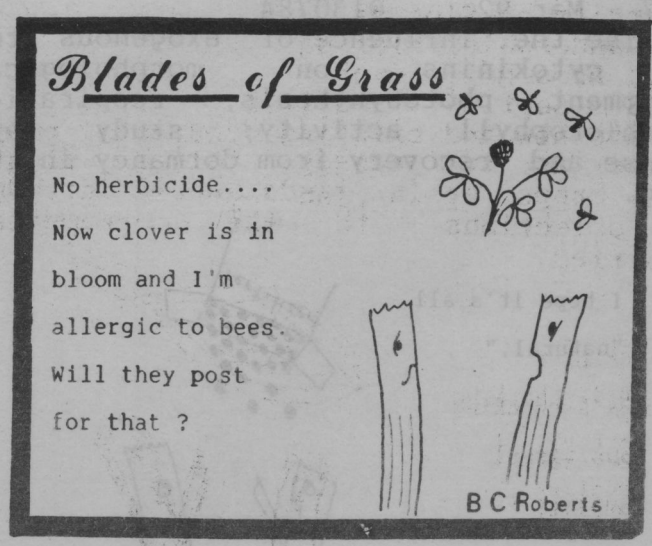
Biology, Management and Host Plant Relationships of Insects Attaching Horticultural Plants
- University of Kentucky
  Lexington, Kentucky
- Potter
- Oct 84 - Sept 89 0093270
- Investigate the biology and ecology of horticulturally important insect pests and develop improved management practices for these pests; evaluate the efficacy and environmental side effects of current pest management practices.

DISEASE RELATIONSHIPS

Resistance of Maize and Fescue to Fungal Pathogens and Mycotoxin-Producing Fungi
- University of Missouri
  Columbia, Missouri
- Calvert
- Jul 85 - Sept 89 0061188
- Identify sources of genetic and/or cytoplasmic incompatibility in maize and in fescue; investigate virulence among fungal isolates in natural and model environments; test the gene-for-gene hypothesis in host-parasite associations with the anamorphs of these fungi.

PESTICIDES - GENERAL

Virginia's Contribution to National Pesticide Impact Assessment
- Virginia Tech University
  Blacksburg, Virginia
- Weaver
- Jun 88 - May 90 0135203
- Provide Virginia data for the National Agricultural Pesticide Impact Assessment Program [NAPIAP]; develop pesticide use profiles for Virginia.



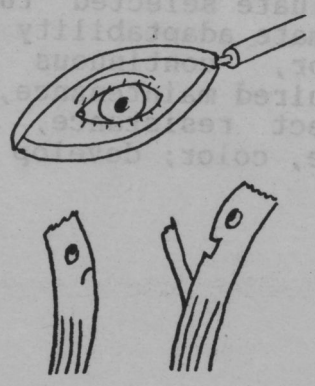
Southeast and Hawaii - Puerto Rico

CULTURAL PRACTICES/CULTIVAR EVALUATIONS

Marketing of Turfgrass Sod
- Auburn University
  Auburn, Alabama
- Adrian, Dickens
- Oct 83 - Sept 86 0091875
- Determine and analyze marketing practices and pricing policies of turfgrass sod producers; determine consumption relationships for alternative grass species and product forms at the consumer level with emphasis on isolating characteristics of turfgrass sod purchasers.

Preliminary Exploratory Research in Ornamental Horticulture at Gainesville
- University of Florida
  Gainesville, Florida
- Sheehan, Carpenter, Kane
- Jan 65 - Jan 99 0031307
- Investigate new problems of ornamental plants including flowers, foliage plants, woody ornamentals and turfgrass.

Introduction and Evaluation of Ornamental Plants
- University of Florida
  Fort Lauderdale, Florida
- Busey, Broschat, Burch
- Oct 83 - Sept 89 0091794
- Evaluate new and existing ornamental plants for use as turfgrasses, foliage plants, floral crops or in landscapes; introduce new selections to the ornamentals industries.



The Effects of Management on the Seasonal Root and Shoot Activity of Turfgrasses
- University of Georgia
  Athens, Georgia
- Karnok
- Jan 87 - Dec 90 0130639
- Determine the seasonal root and shoot activities of warm and cool season turfgrasses as affected by various management practices; evaluate and compare the minirhizotron and rhizotron techniques of monitoring root growth.

Efficient Turfgrass Management
- Georgia Agricultural Experiment Station
  Experiment, Georgia
- Johnson, Carrow
- Jul 82 - Jun 87 0087199
- Study the influence of combinations of fertilization, cultivation and related management practices on quality and growth of turfgrasses and the reduction and prevention of disease problems; evaluate different management practices on several turfgrass species grown under natural shade conditions.

Economic Assessment of Opportunities in Selected Horticultural Enterprises in Georgia
- University of Georgia
  Griffin, Georgia
- Purcell, Ott
- Jul 88 - Jun 93 0093096
- Compare and update basic information on the economically viable horticultural industries including lawn care with respect to pertinent economic information; analyze the potential profitability, sustainability and competiveness of alternative marketing techniques and systems.

Turfgrass Investigations
- Louisiana State University
  Baton Rouge, Louisiana
- Fry
- Oct 85 - Sept 90 0067108
- Investigate influence of water quality on warm season turfgrass, grass establishment by hygromulching and seed priming; study nutrition, light requirements of new cultivars on biological dethatching; evaluate new irradiated cultivars; evaluate weed control chemicals.

Evaluation of Chemical and Fertilizer Application Technology
- Louisiana State University
  Baton Rouge, Louisiana
- Parish, Chaney
- Mar 84 - Dec 89 0092536
- Evaluate and/or modify application equipment for lawn and garden use; develop recommendations for proper equipment use.

Turfgrass Cultivar Adaptability, Cultural Practices and Management Research Evaluations
- Hammond Research Station
  Hammond, Louisiana
- Wells, Constantin, Breitenbeck
- May 87 - Apr 92 0131614
- Evaluate new turfgrass for adaptability to Louisiana conditions; develop cultural and management practices; evaluate plant growth regulating chemicals; determine factors influencing thatch degradation; screen and evaluate potential turf pesticides.

Nursery Crops, Ornamental and Turfgrass Research
- Calhoun Research Station
  Calhoun, Louisiana
- Robbins, Young
- Jul 86 - Jun 91 0082009
- Evaluate cultivars of warm season species for lawn and fine turf use under north Louisiana conditions and to determine cool season species suitable for this environment.

Management Research on Southern Turfgrasses
- Hammond Research Station
  Hammond, Louisiana
- Wells, Constantin, Barrios
- Jan 82 - Dec 86 0086372
- Evaluate warm-season turfgrass cultivars for adaptability to southeast Louisiana conditions; identify weed, insect and disease pests and evaluate and screen existing new chemicals; improve turf maintenance procedures; evaluate industry by-products and sol amendments.

Turf Culture in Mississippi
- Mississippi State University
  Starkville, Mississippi
- Krans, Coats
- Oct 83 - Sept 89 0091711
- Evaluate chemical controls for problem turfgrass diseases, insects and weeds; evaluate new and improved warm and cool season turfgrasses; determine efficacy of chemical pesticides; evaluate nitrogen rates and sources under sun and shade for maintaining turfgrasses.

Establishment, Adaptation and Management of Turfgrasses
- North Carolina State University
  Raleigh, North Carolina
- Gilbert
- Jul 75 - Sept 86 0067922
- Evaluate turfgrass varieties as to establishment, adaptation and management methods and practices.

Turfgrass Culture and Improvement
- Clemson University
  Clemson, South Carolina
- Mazur
- Jul 81 - Jun 87 0084170
- Determine the influence of cultural practices on the serviceability of turfgrasses for various uses; assess the impact of cultural practices on the microbiological and physical properties of the turfgrass ecosystem; develop superior turfgrasses for the transition zone through selection and breeding.

Urban Horticulture for Coastal South Carolina
- Coastal Research and Education Center
  Charleston, South Carolina
- Dufault
- Jul 86 - Jun 90 0082752
- Evaluate selected turfgrass cultivars for climate adaptability using criteria such as vigor, continuous growth, degree of required maintenance, yield, disease and insect resistance, earliness, longevity, size, color; develop recommendations.

BREEDING AND GENETICS - SEED PRODUCTION

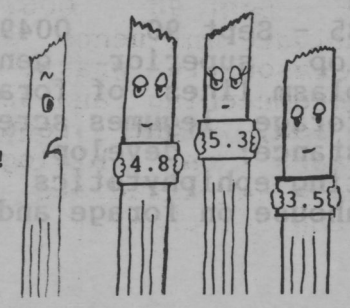
Breeding of Turfgrass and Ornamental Cultivars
- University of Florida
  Gainesville, Florida
- Dehgen, Dudeck, Sheehan
- Jun 83 - Sept 89 0090328
- Develop attractive landscape ornamental cultivars and/or germplasm with lower maintenance requirements and broader environmental tolerances.

Breeding of Turfgrass and Ornamental Cultivars
- University of Florida
  Fort Lauderdale, Florida
- Busey, Giblin-Davis, Howard
- Jun 83 - Sept 89 0090327
- Develop turfgrass cultivars and germplasm with improved adaptive and functional value.

Breeding of Turfgrass and Ornamental Cultivars
- University of Florida
  Bradenton, Florida
- Wilfret
- Jun 83 - Sept 89 0090326
- Develop and release sturdy, low maintenance turfgrasses; investigate fundamental genetic mechanisms for improvement of ornamental plants.

Turfgrass Breeding and Management
- Georgia Coastal Plain Experiment Station
  Tifton, Georgia
- Burton
- Jan 80 - Jan 86 0003492
- Improve the dependability, quality, color, resistance to diseases, insects, nematodes and weeds and tolerance to climatic stress of Cynodon species and perhaps other turfgrasses by breeding; study management and seed production.

Turfgrass Breeding and Management
- Agricultural Research Service
  Tifton, Georgia
- Burton, Wells
- Aug 74 - Mar 85 0041313
- Improve the dependability, quality, color, resistance to diseases, insects, nematodes and weeds and tolerance to climatic stress of Cynodon species and perhaps other turfgrass by breeding and study of management and seed production.



The Breeding, Germplasm Enhancement and Genetics of Forage and Turf Grasses
- Georgia Coastal Plain Experiment Station
  Tifton, Georgia
- Burton
- Jul 86 - Jun 91 0098621
- Enhance forage and turfgrass germplasm by increasing its yield, dependability, quality, stress tolerance and pest resistance; study the genetics of these traits and develop novel and more efficient methods for achieving these objectives.

The Breeding, Germplasm Enhancement and Genetics of Forage and Turf Grasses
- Agricultural Research Service
  Tifton, Georgia
- Burton
- Oct 85 - Sept 90 0140123
- Enhance germplasm by increasing its yield, dependability, quality, stress tolerance and pest resistance.

Cytology, Taxonomy and Germplasm Improvement of Forage and Turf Grasses
- Georgia Coastal Plain Experiment Station
  Tifton, Georgia
- Hanna
- May 86 - Apr 91 0098275
- Develop innovative methods of evaluating, manipulating and improving germplasm; enhance the cytogenetics and taxonomic understanding of species and develop improved germplasm.

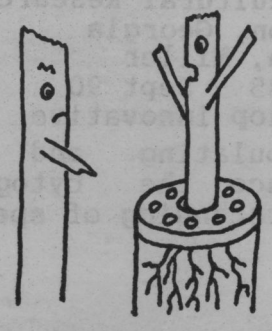
Cytogenetics, Taxonomy and Germplasm Improvement of Forage and Turfgrasses
- Agricultural Research Service
  Tifton, Georgia
- Hanna, Miller
- Oct 85 - Sept 90 0140122
- Develop innovative methods of evaluating, manipulating and improving germplasm; enhance the cytogenetics and taxonomic understanding of species.

Develop Disease Resistance in Forage and Turf Grasses and Legumes
- Agricultural Research Service
  Tifton, Georgia
- Wells
- Oct 85 - Sept 90 0049791
- Develop superior genetic stocks and germplasm lines of forage and turfgrasses and forage legumes screening for disease resistance; develop new systems for creating ephiphytotics in the field and greenhouse on forage and weed species.

Develop Disease Resistance in Forage and Turf Grasses and Legumes
- Georgia Coastal Plain Experiment Station
  Tifton, Georgia
- Wilson
- Jan 86 - Sept 90 0097334
- Develop superior genetic stocks and germplasm lines; screen for disease resistance; develop new systems for creating ephiphytotics in the field and greenhouse.

Evaluation of Grasses and Their Management for Turf in the Tropics
- University of Hawaii
  Honolulu, Hawaii
- Murdoch
- Oct 86 - Sept 91 0058796
- Determine the salinity tolerance of turfgrass cultivars presently grown in Hawaii to screen local selections for salinity tolerance; evaluate tissue culture techniques for producing new biotypes tolerant of salinity; evaluate pest control measures.

Tissue Culture of Turfgrasses
- Mississippi State University
  Starkville, Mississippi
- Krans
- Oct 86 - Sept 91 0099679
- Define and/or optimize in vitro plantlet formation in Agrostis palustris, Cynodon dactylon, Zoysia japonica and Eremochole ophiuroides; develop in vitro cell selection procedures; recover elite germplasm with tolerance to salt, herbicides and/or pathotoxins.



Plant Cell and Tissue Culture of Turfgrasses
- Mississippi State University
  Starkville, Mississippi
- Krans
- Oct 81 - Sept 86 0085167
- Elucidate parameters of plantlet regeneration from callus of major cool and warm-season turfgrasses; evaluate mutant selection schemes for recovery of desirable variants in selected turfgrasses.

Environmental Effects on Plant Gene Expression
- Mississippi State University
  Starkville, Mississippi
- Buthe
- Jul 89 - Jun 94 0138114
- Identify factors involved in heat tolerance in creeping bentgrass.

SOIL PROPERTIES
- CLIMATE AND STRESS

Influence of Controlled Traffic and Interrelationships of Soil, Water and Nutrients on Turf
- Auburn University
  Auburn, Alabama
- Dickins
- Oct 88 - Sept 93 0135788
- Determine influence of controlled traffic on development of sod; compare mobility and use efficiency of nitrogen and water in sod grown with and without traffic.

Economic and Agronomic Aspects of Commercial Turfgrass - Sod Production
- Auburn University
  Auburn, Alabama
- Adrian, Dickens
- July 88 - Sept 91 0135249
- Determine the nature and scope of the commercial sod industry; evaluate cultural practices and economic and financial relationships for alternative sizes and types of sod production systems.

Influence of Soil Fertility on Other Parameters on the Growth and Quality of Turfgrasses
- University of Florida
  Gainesville, Florida
- Dudeck, Peacock
- Oct 83 - Sept 85 0091702
- Evaluate performance of species and cultivars to varying fertility levels; determine tolerance to salinity and document the response of turfgrasses to saline irrigation; investigate influence of fertilization practices on tolerance to saline irrigation.

Influence of Soil Fertility and Other Parameters on the Growth and Quality of Turfgrasses
- University of Florida
  Fort Lauderdale, Florida
- Augustin, Snyder
- Oct 82 - Sept 85 0088598
- Determine the optimal management practices for stress conditioning of southern turfgrasses.

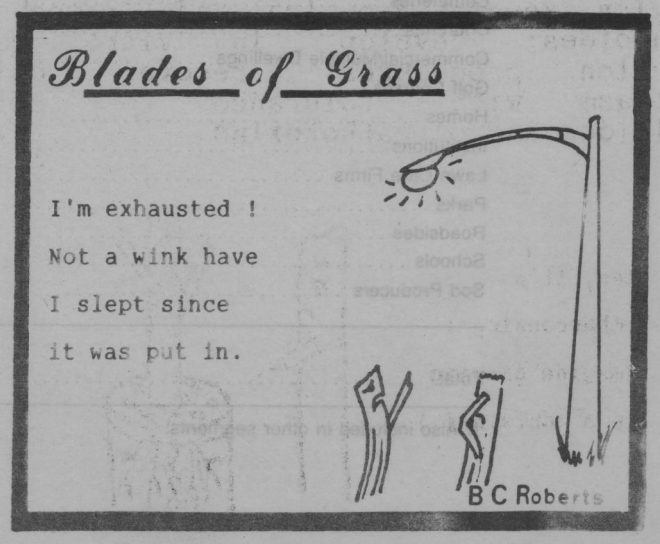
Environmental Factor Affecting Ornamental Plants
- University of Florida
  Brandenton, Florida
- Stanley, Harbaugh
- Jan 87 - Sept 91 0130732
- Determine the effects of light, water and temperature on physiological processes, growth and production of ornamental plants, including turfgrasses.

Influence of Drought-Traffic Stresses and Management on Turfgrass Growth and Water Relations
- Georgia Agricultural Experiment Station
  Experiment, Georgia
- Carrow
- Jul 86 - Jun 91 0098132
- Determine growth versus water use relations; evaluate relative importance of different drought tolerance/avoidance mechanisms; determine mechanisms of injury and acclimation to soil compaction; study iron-nitrogen fertilization regimes.

Water Management and Soil Characteristics in Relation to Crop Yield and Nitrate Leaching
- Agricultural Research Service
  Watkinsville, Georgia
- Bruce
- Jan 87 - Jan 92 0142519
- Identify soil characteristics which can be modified to improve infiltration; develop cultural practices for increasing and sustaining infiltration and for decreasing nitrate loss from soil rooting zones.

Freezing and Submersion Stress Effects on Warm Season Turfgrasses
- Louisiana State University
  Baton Rouge, Louisiana
- Fry
- Oct 88 - Sept 92 0136256
- Compare response of warm season species and cultivars to freezing and fluctuating spring temperatures; observe influence of mowing height and potassium on freezing resistance; identify plant and environmental factors influencing submersion injury.

Environmental Stress Physiology of Turfgrasses
- North Carolina State University
  Raleigh, North Carolina
- Dipaola
- Oct 85 - Sept 90 0096766
- Determine mechanisms of stress injury and environmental stress limits; determine influence of syringing; examine the potential of cultural treatments for prevention and control of localized dry spot; determine growth suppression effectiveness of turf retardants.



PENNSYLVANIA TURFGRASS SURVEY

Detailed Report Now Available

This recently completed survey indicates that $1.46 billion was spent to maintain nearly two million acres of turfgrass in Pennsylvania.

Turf represents a permanent investment in better living through increased real estate value, safer roadsides and recreational facilities, and a number of environmental enhancements.

There were 1.6 million acres of home lawns in the state on which over one billion dollars of maintenance was provided. Also surveyed were: airports, cemeteries, churches, commercial/multiple dwellings, golf courses, institutions, lawn care companies, parks, roadsides, schools and sod producers.

Contact: Pennsylvania Turfgrass Council
P O Box 1078, Lemont PA 16851
Cost: $7.50 plus postage & handling

SUMMARY

Pennsylvania had 1,999,408 acres of turfgrass in 1989. Home lawns account for the largest share of the total turf area with 68 percent of the acreage. Roadsides had the second largest total, accounting for slightly more than 5 percent, followed by commercial property and multiple family dwellings with slightly less than 5 percent of the acreage.

Total turf maintenance expenditures were $1.46 billion. Home lawns spent the most to maintain turf with 77 percent of the expenses. Golf course expenditures accounted for the next largest share with 7 percent of the total, followed by lawn care firms with 6 percent of the expenses.

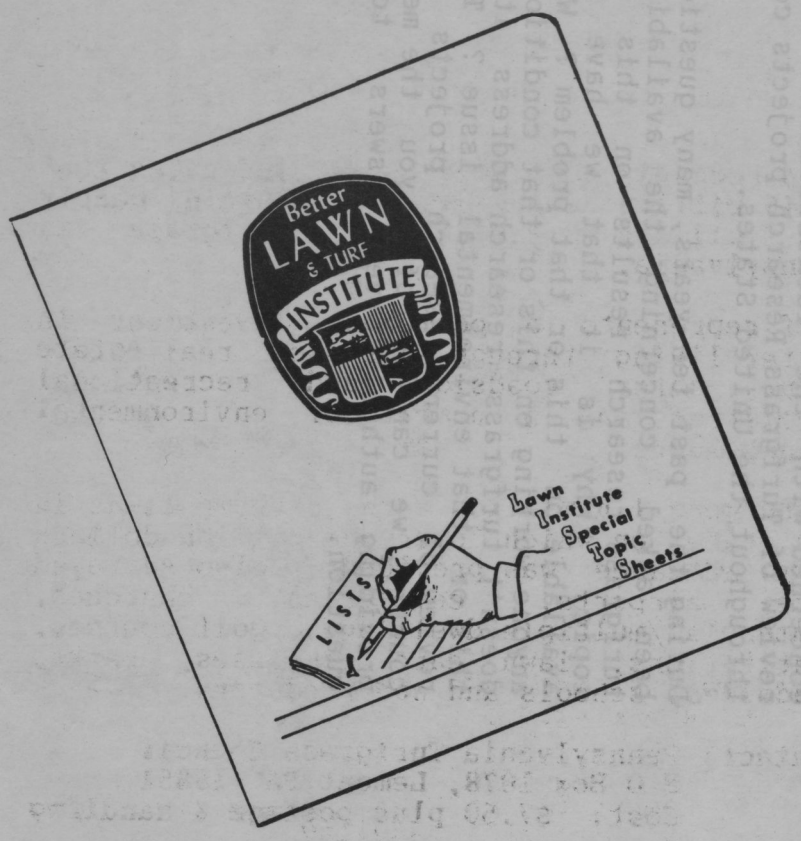
The value of all equipment used for turf maintenance was $2.95 billion. Purchases of new and used turf equipment was just over $500 million.

PENNSYLVANIA TURFGRASS SURVEY: 1989 SUMMARY STATISTICS FOR THE VARIOUS INDUSTRY SEGMENTS IN PENNSYLVANIA

Segment	Turf Area	New Turf	Total Maint. Expense	Value of Turf Eqpmt.	Cost of New Turf Eqpmt.
	Acres	Acres	(000) Dollars	(000) Dollars	(000) Dollars
Airports	24,290	451	2,190	4,940	460
Cemeteries	19,170	216	12,845	9,695	1,290
Churches	32,400	575	15,015	14,040	1,300
Commercial/Multiple Dwellings	92,700	797	67,350	155,290	23,600
Golf Courses	70,500	965	105,605	152,975	21,460
Homes	1,355,000	29,000	1,114,650	2,478,350	434,000
Institutions	10,690	47	5,875	5,280	260
Lawn Care Firms	199,610 1/	3,823 1/	91,385	60,790	10,945
Parks	42,000	571	10,200	18,655	1,435
Roadsides	102,073	927	6,965	9,230	1,310
Schools	48,330	400	19,645	34,300	4,505
Sod Producers	2,645	958	2,890	1,746	267
Total	1,999,408	38,730	1,455,065	2,945,291	500,832

1/ Also included in other segments.

Warvests
23



LISTS NOTEBOOK

Now Available

A new book has just been published by The Lawn Institute in Pleasant Hill, Tennessee. The format is loose leaf notebook with 385 pages comprising 102 special topics of concern to home gardeners and professional turf managers alike.

The topics are organized in 12 chapters:

- Trends,
- Seed,
- Cultivars,
- Water,
- Mowing,
- Soil-Turf,
- Pest Control,
- Low Maintenance,
- Lawns,
- Sports Turf,
- Establishment-Renovation,
- I Speak for the Lawn.

Information presented is technically detailed but formatted differently from current textbooks. As such, each topic is self-contained to enhance complete understanding. The notebook is especially designed for use by all involved in oral or written communication. Tailor-made news releases, newsletters, white papers, environmental statements and other special reports can be easily prepared from these topics. They also are appropriate for in-house staff training or for instruction in turfgrass management.

The loose leaf notebook allows selected pages to be removed, copied and then cut and pasted - added to, subtracted from, edited, etc - to prepare the exact statement needed for your report or oral presentation. Original sheets go back in notebook for reuse. No copyright is registered on this material. The Lawn Institute is always pleased to have communicators rely on us as the source of this information. Technical accuracy is assured.

These notebooks are available from: The Lawn Institute, P O Box 108, Pleasant Hill, Tennessee 38578 at cost - $30.00 postpaid. Or call Beverly Roberts - 615/277-3722 - for additional information.

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Lawn Institute Harvests is published four times a year by The Better Lawn and Turf Institute. The headquarters office address is P O Box 108, Pleasant Hill, Tennessee 38578-0108. Phone: 615/277-3722. Inquiries concerning all aspects of this publication may be addressed to the headquarters office.

The Better Lawn and Turf Institute is incorporated as a nonprofit business league formed exclusively for educational and research purposes concerned with agronomic, horticultural and landscape concepts.

Lawn Institute Harvests is dedicated to improved communications among turfgrass seed and allied turf industries and other firms, businesses, organizations and individuals with lawngrass research and educational interest and concerns.

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