NCSU Turf Enrollment

- 2-yr: 108 students
- 4-yr: 58 students
NCSU Center for Turfgrass Environmental Research and Education

18 projects currently funded
Results are presented at Turf Conference Jan. 8-10, 2008 at North Raleigh Hilton
Center for Turfgrass Environmental Research & Education (Projects Funded)

- The Effect of Low-Input Homeowner Management Practices on Pest Populations and Pest Damage (Bambara)
- Nitrogen Uptake Kinetics of Turfgrass Roots as a Determinant of Nitrogen Use Efficiency (Bowman)
- The Development of Environmentally-Sound Management Programs for White Grubs (Brandenburg)
- Continuation of Research on Spatial Dynamics of Pest Management in Turfgrass (Burton)
- Support for Faculty Visitation of Students Fulfilling Internships at North Carolina Facility During 2007 (Cooper)
- Quantification of Canada Goose Damage and Repellency in Managed Turfgrass Systems (DePerno)
Center for Turfgrass Environmental Research & Education (Projects Funded)

- Evaluation of Evapotranspiration-Based and Soil-Moisture-Based Irrigation Control in Turf (Grabow)
- Ecology and Management of Earthworms in Turfgrass Systems (Hu)
- Evaluation of Warm-season Turfgrasses and Their Response to Cultural Practices in North Carolina and Screening of Tall Fescue Cultivars for Drought Tolerance (Miller)
- Developing Water Conservation and Water Quality Management Strategies for Turfgrasses in North Carolina (Peacock)
- Biotechnological and Conventional Breeding for Turfgrass Improvement (Qu)
- Response of Turfgrass Species to Herbicide Contaminated Irrigation Water (Richardson)
Center for Turfgrass Environmental Research & Education (Projects Funded)

- Heat Stress Affects on Turfgrass System Ecology: Resolving Inter-relationships Between Plant Health and Soil-based Processes (Rufty)
- Solving Important Water Issues with Turfgrass Systems (Sinclair)
- Soil Nitrogen Dynamics in Warm- versus Cool-season Turfgrass Systems (Shi)
- Biology and Management of Fairy Ring in Golf Course Putting Greens (Tredway)
- Development of Computer-Based Decision-Making Tools, Phase III (Wilkerson)
- Role of Organic Matter Soil Microorganisms, and Downward Mobility in Determining Fate of Pesticides in Managed Turfgrass Systems vs. Bare Soil (Yelverton)
ORGANIZED BY CATEGORIES

- ACADEMICS
- INSECTS
- WEEDS
- DISEASES
- WATER
- ALERTS & MORE

TARGET AUDIENCES SPECIFIED

THE NEW TurfFiles

www.TurfFiles.ncsu.edu

November TurfTips
Fertilize your tall fescue lawn according to soil test recommendations in November (about the time the grass is green but not actively growing). DO NOT fertilize St. Augustinegrass at this time. DO NOT apply nitrogen to zoysiagrass at this time.

Diseases 
- Brown Spot
- Mildew
--down
- -ry Blight
- -ry Blotch

Other Pests
- Ants
- Thrips

Guides
- Care of Lawns
- Maintenance of Lawns
- Use of Lawn Equipment

Carolina Lawns
Lawns are smooth, living carpets that add beauty and recreational space to your home. The benefits of a healthy lawn go beyond the obvious. As your grass grows, it is working to help the environment by stabilizing soil and reducing air pollution, noise, heat, dust, and glare. Surveys show that an attractive, well-landscaped lawn can even add value to your home. To reap the rewards of a handsome lawn, take great care in the selection, establishment, maintenance, and renovation of your lawn grass. With proper choices, a durable lawn will grow with minimal care.

TurfFiles is funded by the Center for Turfgrass Environmental Research & Education (CENTERE) through public and private grants.
Press push throughout August, September, & October

Track actual water needs & use

Tips on checking irrigation system

Potential to save millions of gallons of water in NC

Requests for this program in Georgia and South Carolina

1200 users signed up since August
2007 NC STATE FAIR
Turfgrass Fashion Show

Live shots featured on ABC-11 News

2 Pages in the Sunday October 23rd News & Observer Featuring State Fair promotion of TIMS
FESCUE GOES FABULOUS
The 2007 N.C. State Fair ended its 10-day run with a new all-time record attendance of 858,611.
TurfFiles

Even though TurfFiles content is fully searchable, we felt more could and should be done to assist homeowners and turfgrass professionals in making critical turf management decisions. Interactive decision aids have been developed to assist with

- turfgrass selection
- turfgrass and weed identification
- weed management
- disease identification
TurfFiles Decision AIDS:
What Is This Turfgrass/Weed/Disease and How Do I Manage It?
Gail Wilkerson, Bridget Lassiter, Joe Levine, Jenifer Reynolds, Emily Erickson, Fred Yelverton, Art Bruneau, and Lane Tredway
Crop Science & Plant Pathology Departments, College of Agriculture and Life Sciences, NC State University

Program Usage
The Turf and Weed ID and Weed Management decision aids were made available on TurfFiles in March 2005.

The Turfgrass Selection decision aid was released in August, 2005. The Turf and Weed ID program has been by far the most popular application, accounting for 20% of total TurfFiles site access from April 2005 through March 2006, and for 30% from April 2006 through September 2006.

During the April 2005 – March 2006 period, 17% of usage came from within the NCSU community (including students, staff, faculty, and Extension agents). NCSU usage was 11% of the total during the past six months.

Acknowledgements
Funding for this work has been supplied by the Center for Turfgrass Environmental Research and Education.

www.TurfFiles.ncsu.edu/decision-aids/
Turf and Weed Identification

Both turf and weed management depend upon correct identification of the species involved.

Many different broadleaf, grass, and sedge species can be found in established turfgrass systems in North Carolina.

This decision aid includes information on 30 grass, 55 broadleaf, and six sedge species and utilizes more than 1600 plant images to aid in identification.
TurfFiles Decision AIDS: What Is This Turfgrass/Weed/Disease and How Do I Manage It?

Weed Management

This decision aid assists the user in choosing both cultural and chemical control tactics. Deciding upon the best way of controlling a weed problem is complicated by the availability of a large number of herbicides that vary greatly in efficacy, cost, and impact on turf quality and the environment.

Tolerance of the turfgrass species to each herbicide must be considered.

Recommendations are based on data from over 300 NCSU herbicide trials.

Acknowledgements

Funding for this work has been supplied by the Center for Turfgrass Environmental Research and Education.

www.TurfFiles.ncsu.edu/decision-aids/
Turfgrass Selection

Many problems can be avoided by choosing a turfgrass species and cultivar that are adapted to conditions at a given site. This decision aid helps users determine the most appropriate turfgrass to plant. Information includes:

- adaptation to drought, shade, heat, and wear
- appearance
- preferred season
- establishment rate
- planting and maintenance requirements
- seasonal images
- results of university cultivar trials

TurfFiles Decision AIDS:
What Is This Turfgrass/Weed/Disease and How Do I Manage It?
Disease Identification

This application will be released by the end of 2006.

It is similar to the Turf and Weed ID program, with modifications in the criteria selection screen to make a more efficient use of space.

Host species, time of year, stand symptoms, plant symptoms, and fungal signs assist in diagnosis. It includes 32 turf diseases.
Development of Computer-Based Decision-Making Tools

Gail Wilkerson, Crop Science

www.TurfFiles.ncsu.edu
Development of Computer-Based Decision-Making Tools

New TurfFiles – www2.TurfFiles.ncsu.edu

- Programming completed
- Being tested
- Screens still being finalized
- Available soon
Development of Computer-Based Decision-Making Tools

New TurfFiles – www2.TurfFiles.ncsu.edu

- Information organized in tab structure
- View by topic, keyword, author
- Sort by date, title, author
- Information sheets for disease, insect, weed, and other pests

www.TurfFiles.ncsu.edu
Development of Computer-Based Decision-Making Tools

Turf & Weed ID, Turfgrass Selection, Weed Management

- Updated to Visual Studio 2005
- Herbicide data from 2007 trials added
- Information on more weeds added (108 species)

[Cultural Practices and Herbicide Information]

**Cultural Practices**

Corn speedwell is a low-growing winter annual that thrives in thin open turf and often appears in solid stands. Winter annual broadleaf weeds germinate in the fall or winter and grow during any warm weather, which may occur in the winter, but otherwise remain somewhat dormant during the winter. They resume growth and produce seed in the spring and die as temperatures increase in late spring and early summer. They quickly invade thin turf areas especially where there is good soil moisture. Shade may also encourage growth. A dense, vigorous turf is the best way to reduce the encroachment of this weed.

First, select adapted turfgrass cultivars for your area and then properly fertilize, mow, and water to encourage dense growth. Corn speedwell is similar in appearance to Persian and melloid speedwell.

**Herbicide Information**

Even though corn speedwell is smaller than either Persian or melloid speedwell, it is more difficult to control since many of the herbicides that are effective against melloid and Persian speedwell do not work well against corn speedwell. For corn speedwell, repeat applications of a three-way combination product at one-half the label rate, applied 10 days apart, provide good control. Good to excellent control can be achieved with one application of atrazine (Aatrex 4L), metribuzin (Manor, Blade, etc.), trifloxysulfuron (Monument), or quinclorac (Clive).

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>FINAL % CONTROL</th>
<th>HERBICIDE</th>
<th>RATE per 1000 gal</th>
<th>PLACEMENT</th>
<th>APPLICATION DATE</th>
<th>FINAL RATING DATE</th>
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<td>100</td>
<td>Aatrex 4L</td>
<td>1.5 oz</td>
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<tr>
<td>Trial: 05-713 (10/07)</td>
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<td>Monument 1/2WG + X-77 Spreader</td>
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<td>Foliar</td>
<td>3/30/2005</td>
<td>5/23/2005</td>
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<tr>
<td>Trial: 05-736</td>
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<td>Manor + X-77 Spreader fol by</td>
<td>0.25 % VV</td>
<td>Foliar</td>
<td>3/30/2005</td>
<td>6/30/2005</td>
</tr>
</tbody>
</table>
Development of Computer-Based Decision-Making Tools

Disease ID & Disease Management

- ID program available on new TurfFiles site
- Information on disease management in database and being used in information sheets
- Management program ready by spring
Persistence of Carfentrazone Dislodgeable Foliar Residues Following Application to Tall Fescue Turf

C.V. John¹, R.J. Cooper¹ and Damian Shea²

¹ Dept. of Crop Science, NCSU, Raleigh, North Carolina, 27695
² Dept. of Environmental & Molecular Toxicology, NCSU, Raleigh, North Carolina, 27695
Results

Persistance of Dislodgeable Carfentrazone Residues

![Graph showing persistence of dislodgeable carfentrazone residues over time.](image)

Figure 1. Dislodgeable Foliar Residues (DFR) of Carfentrazone (ng/ft\(^2\)) as determined for 15 d following application.
Sorption and Degradation of Pesticides in Turfgrass Soils

• Examine differences in pesticide degradation kinetics as turfgrass systems age.
• Quantify degrees of sorption of simazine and metolachlor to bulk soil and macroorganic matter fractions from a chronosequence of turfgrass systems.
• As turfgrass soil systems age, increasing levels of organic matter in the surface soil (0-5 cm) result in higher sorption of simazine.

• Increased microbial activity in turfgrass systems caused high microbial degradation at all ages, and higher bioavailability led to more \( ^{14}\text{CO}_2 \) production.
Bayer Environmental Science Graduate Research Assistantship

- initiated in 2006
- collaborative effort to increase our understanding of the basic biology of turfgrass pests
- fairy ring biology and management selected as the first project
Fungicides Labeled for Fairy Ring Control

- azoxystrobin (Heritage)
- flutolanil (ProStar)
- polyoxin D (Endorse)
- pyraclostrobin (Insignia)
- triadimefon (Bayleton, 2ee)
DMIs for Fairy Ring Control: Background

- fairy ring activity observed during development of triadimefon
- superintendents in Gulf Coast states have been using Bayleton for preventative fairy ring control
- Bayleton received 2(ee) label for fairy ring control in 16 states in Feb. 2006
- how do DMIs compare to other chemistries for preventative control?
Rate and Timing of DMIs for Fairy Ring Prevention

Fungicide / Rate

- Bayleton - 1 oz/1000 ft²
- Bayleton - 2 oz/1000 ft²
- Lynx - 1 fl oz/1000 ft²
- Lynx - 2 fl oz/1000 ft²

Soil temperature at initiation (5-day average)

- 50°F
- 55°F
- 60°F
- 65°F

USGA putting green established in 2004 with ‘A-1’ creeping bentgrass

All treatments watered-in immediately with 0.25” of irrigation

Cascade soil surfactant (8 fl oz/1000 ft²) applied on 3/20, 5/2, and 7/25

**Data is averaged across all application timings**

**Data is averaged across all fungicides and rates**
Lynx, D, 1 fl oz

Bayleton, D, 2 oz
Current Recommendations for Fairy Ring Prevention

- Initiate applications when 5-day average soil temperatures reach 55°F.
- Make two applications of triadimefon (Bayleton) at 1 oz/1000 ft² on a 21 to 30 day interval.
- Once released, tebuconazole (Lynx) may also be applied at 1 fl oz /1000 ft².
- Water in the application immediately with 0.25” of irrigation.
Biotechnological and Conventional Breeding for Turfgrass Improvement

R. Qu, S. Dong, H. D. Shew, L. Tredway, R. Li, A. Bruneau, D. Livingston, C. Reynolds
Objectives

• Introduce fungal disease resistance genes into tall fescue for resistance to gray leaf spot and brown patch diseases
• Through variations from tissue culture and induction of mutants to breed St. Augustinegrass for finer leaf texture and improved cold tolerance
Gray leaf spot resistance in transgenic tall fescue plants

CK | Lys9A
---|-----

CK | Glu3A
Brown patch resistance in transgenic tall fescue plants
Somaclonal variations and mutants in St. Augustinegrass

16 somaclonal variants and 18 mutants, mostly having semi-dwarf growth habit, are obtained and currently in the field tests.
2007 NCSU Variety Evaluation Trials Update

Study Directors
Dr. Art Bruneau and Casey Reynolds
Dr. Grady Miller and Scott Brinton
Species and variety trials are used to evaluate every major species of grass commonly used in NC including:

- **Warm season species**
  - Bermudagrass
  - Zoysiagrass

- **Cool season species**
  - Bentgrass (creeping and velvet)
  - Ryegrass
  - Tall fescue
  - Kentucky bluegrass
  - ‘Heat-tolerant bluegrass’
The following is a list of trials currently ongoing at NCSU with special relevance to golf courses:

- **Warm season species**
  - 2007 NTEP Bermudagrass Trial
  - 2007 NTEP Zoysiagrass Trial

- **Cool season species**
  - 2003 NTEP Creeping Bentgrass Trial
  - 2007 Winter Overseeding Trial

*Year refers to the year the trial was planted*
NCSU Variety Evaluation Program

• Different types of trials
  – NTEP Trials
    • NTEP stands for the National Turfgrass Evaluation Program.
    • NTEP is designed to develop and coordinate uniform evaluation trials of turfgrass varieties and promising selections in the United States and Canada.
    • NTEP trials run for five years with data collection taken monthly and summarized at the end of each calendar year.
Different types of trials (continued)

Regional trials

- In addition to national trials such as NTEP, we establish regional trials for seed producers who want to evaluate their seed specifically in North Carolina.
- Regional trials are typically planted in more than one location in NC (mountains, piedmont and coastal plain).
- These trials run for three years with data being collected monthly and summarized at the end of each calendar year.
Data from regional trials can be accessed via the NCSU turffiles website.

Simply go to:
- Publications
- Cultivar evaluations

Data from NTEP Trials can be found at: www.NTEP.org
NCSU Variety Evaluation Program

2007 NTEP Bermudagrass trials

- Location:
  - Raleigh, NC: NCSU Turfgrass Field Lab
  - Established June 21st, 2007
  - Duration: 5 years

- Entries:
  - 33 total entries
    - 27 seeded
    - 6 vegetative

Data available on Turffiles at the end of each calendar year
Establishment rate Data:
Tifway (Plugged)
7 Weeks After Planting
NCSU Variety Evaluation Program

Establishment rate Data:
OKC 1134 (Plugged)
7 Weeks After Planting
In addition to establishment data, monthly data are being collected on the characteristics such as:
- Overall quality
- Density
- Texture
- Fall color
- Spring green-up
- Disease incidence, etc.
NCSU Variety Evaluation Program

2007 NTEP Zoysiagrass trials

• Location:
  – Raleigh, NC: NCSU Turfgrass field labs
  – Established June 22\textsuperscript{nd}, 2007
  – Duration: 5 years

• Entries:
  – 11 total entries
    • 1 seeded
    • 10 vegetative

Data available on Turffiles at the end of each calendar year
2003 NTEP Bentgrass Trials

• Location: Raleigh, NC
  – NCSU Turfgrass field labs
  – Seeded 9/25/2003

• Entries:
  – 20 Creeping bentgrasses
  – 6 Velvet bentgrasses
2003 NTEP Bentgrass trials (2006 Results)

- All of the creeping bentgrasses performed significantly better than the velvet bentgrasses.
- The top performing creeping bentgrasses were:
  - Alpha IS-AP 9*
  - Bengal SRX 1GD*
  - CY-2* SRX 1GPD*
  - Independence 13-M*
  - LS 44 235050*
  - Penn A1

NOTE: NCSU has applied to host the new 2008 NTEP Bentgrass trial to be planted next fall.
2007 Winter Overseeding Trials

- 18 Perennial Ryegrasses
- 4 Intermediate and Annual Ryegrasses
- 4 Roughstalk Bluegrasses
2007 Winter Overseeding Trials

- Planted on 10/22/07 at Eagle Point Country Club in Porter’s Neck, NC
- Plots will be evaluated monthly for:
  - Color, Quality, Density, Texture
  - Spring Transition
  - Data will be reported on Turffiles after entries have completely transitioned in the summer or 2008
Conclusions

• NCSU will continue to test new varieties and species each year.
• Data will be taken, analyzed, and made available to the industry as it becomes available through the following methods:
  – Conferences and workshops
  – Field days
  – The internet
    • [www.turffiles.ncsu.edu](http://www.turffiles.ncsu.edu)
    • [www.NTEP.org](http://www.NTEP.org)