

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Turfgrass Development and Management

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
111	Conservation and Efficient Use of Water	13%		10%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		10%	
202	Plant Genetic Resources	5%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		15%	
204	Plant Product Quality and Utility (Preharvest)	0%		5%	
205	Plant Management Systems	67%		15%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	2%		10%	
212	Pathogens and Nematodes Affecting Plants	3%		10%	
216	Integrated Pest Management Systems	10%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	1.6	0.0	2.0	0.0
Actual	2.0	0.0	2.1	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
35000	0	87537	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
35000	0	87537	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
300000	0	560218	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

New turf germplasm/varieties will be generated by our program. These products will have improved abiotic and biotic stress resistance/tolerance. Research will identify the elite performing varieties from both our program and from industry. Research will identify new or refined integrated management practices. Educational materials will be developed featuring improved varieties and how to properly maintain them. Intense and effective educational programming will be conducted to help integrate this information into existing management programs. Rational decision making based on the combination of science, perception and sound public policy will be made by the turf industry and the public at large. Resultant adoption of integrated turfgrass management strategies will occur and turfgrass performance can be maintained or improved with reduced potential negative environmental impacts.

2. Brief description of the target audience

Audiences include governmental, private industry and multiple end-user areas. Research audiences: basic and applied plant science/turf science researchers, including those from the CSSA, and ASHS. Funding agency audiences: USGA, GCSAA, USDA, OTRF and many private corporations. New cultivars developed as well as products such as trade articles, fact sheets, and educational programming will be provided to the target audiences characterized as the turfgrass production sector (sod and seed producers), service sector (landscape/lawn care and pest control operators) and turf managers (which include the golf course, parks & grounds, right of way managers and home consumers).

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	2000	10000	0	0
Actual	26786	32411	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2010

Plan: 0
 Actual: 2

Patents listed

OKC 1134? bermudagrass. Filed Nov 1, 2010. US Provisional Patent Application 61/456,133. Turf Bermudagrass. OSU Ref. 2011.07 (OKC 1134). Inventors: Wu, Y., D.L. Martin, C.M. Taliaferro, J.A. Anderson and J.Q. Moss.

?OKC 1119? bermudagrass. Nov 1, 2010. US Provisional Patent Application 61/456,109. Turf Bermudagrass. OSU Ref. 2011.08 (OKC 1119). Inventors: Wu, Y., D.L. Martin, C.M. Taliaferro, J.A. Anderson and J.Q. Moss.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	5	5	
Actual	3	3	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer-reviewed journal articles manuscripts submitted

Year	Target	Actual
2010	5	4

Output #2

Output Measure

- Number of final stage experimental bermudagrasses sent to national testing phase in the NTEP bermudagrass trial

Year	Target	Actual
2010	1	2

Output #3

Output Measure

- Number of turf/roadside vegetaion management workshops conducted

Year	Target	Actual
------	--------	--------

2010

15

20

Output #4

Output Measure

- Number of turfgrass managers trained in improved varieties and integrated turfgrass management systems

Year

Target

Actual

2010

500

1135

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	New varieties appearing in the Oklahoma sod trade for the first time
2	New turf varieties used by the Oklahoma golf course industry
3	Number of turfgrass manager participants intending to adopt improved turf management practices
4	Turfgrass varieties evaluated for freeze tolerance
5	Reduce unneeded fungicide application to bentgrass putting greens

Outcome #1

1. Outcome Measures

New varieties appearing in the Oklahoma sod trade for the first time

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	1	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cool-season turfgrasses are utilized in shaded lawns and landscapes in Oklahoma. Traditionally only tall fescue was used in these areas. However, mixing of Kentucky bluegrass with tall fescue can result in increased cool-season grass stand persistence. Presumably the increased persistence is due to increases brown patch fungal disease.

What has been done

Since 2000, a list of suggested improved Kentucky bluegrasses and tall fescues has been provided to key turfgrass seed distributors with the intent of influencing whole sale buying decisions of the regional distributors as well as the improved varieties making their way to sod producers and consumer alike. As in previous years, information was provided to two regional seed distributors.

Results

Two sod producers utilized the improved tall fescue/Kentucky bluegrass 90:10 mixes to seed fields in 2009 resulting in increased availability of improved cool-season turfgrass products during the 2010 growing season. Reduced severity of brown patch fungal disease is anticipated on sites that utilized the improved mixes during the 2011 and subsequent growing season.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 204 Plant Product Quality and Utility (Preharvest)
- 205 Plant Management Systems

Outcome #2

1. Outcome Measures

New turf varieties used by the Oklahoma golf course industry

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	0	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A number of environmental and disease pressures are present on golf course putting greens. Creeping bentgrass is considered the elite putting surface grass but is disease prone. Improved disease resistance amongst creeping bentgrass varieties is known. Use of hybrid bermudagrasses can improve summer putting green stand persistence but regular covering of bermudagrass greens with tarps is necessary during acute low temperature events in winter.

What has been done

Five key inquiries were responded to with performance information on improved putting green varietal and species options. While educational programming at turfgrass conferences is important, critical decisions by golf course superintendents often come about from a multi-month fact gathering process which not only includes turfgrass conference educational information but extensive follow up research by the superintendent, including follow up consultations.

Results

Three golf courses in Oklahoma were converted from creeping bentgrass to more heat and drought tolerant Champion hybrid bermudagrass. The success of the installations will be judged over the next 5 years. One low budget private course in Osage county Oklahoma will trial an experimental OSU variety on their putting greens. Use of the yet un-named experimental putting green bermudagrass from OSU will increase the knowledge base concerning the potential for commercialization of this cold tolerant experimental variety. Declaration variety of creeping bentgrass was overseeded on one golf course in Oklahoma. Declaration, an offering from private industry, has shown improved dollarspot disease resistance in national putting green screening

trials.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #3

1. Outcome Measures

Number of turfgrass manager participants intending to adopt improved turf management practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	400	1029

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New integrated turfgrass management practices can include development of disease resistant or stress tolerant varieties, elucidation of techniques that allow for improved pest control with equal or less pesticide applications.

What has been done

A spring dead spots disease/winter kill management workshop, a summer general turfgrass field day, a two day general turfgrass conference, 3 sprayer calibration workshops and 14 roadside vegetation management continuing education workshops were conducted to teach Best Management Practices in fine and roadside turfgrass in 2010. Over 1,135 attendees were present at these workshops.

Results

Eighty percent of fine turf managers trained and 100% of roadside vegetation managers trained (a combined figure of 1,029 attendees) stated that they would be adopting the suggested Best Management Practices provided in the training sessions. Seventy percent of attendees felt the

knowledge gained would help them manage turf in a more environmentally conscience manner. Forty-seven percent of attendees felt that increased knowledge would allow them to save their employers money in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

Turfgrass varieties evaluated for freeze tolerance

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The ability to survive harsh winters is one of the primary factors limiting bermudagrass (*Cynodon* sp.) use across wide geographic areas. Consequently, improved stress tolerance has been a goal for programs breeding bermudagrasses.

What has been done

We evaluated freeze tolerance of OSU experimental bermudagrasses ?OKC 1119? and ?OKC 1134? as well as freeze tolerant and freeze susceptible cultivars for freeze tolerance in a controlled environment chamber.

Results

Freeze tolerance of OKC 1119 and OKC 1134 was not significantly different from Midlawn, a freeze tolerant reference cultivar. Patriot had greater freeze tolerance than all of the other

genotypes examined, except OKC 1134. Tifway, a freeze susceptible standard cultivar, had freeze tolerance significantly less than the other cultivars examined. OKC 1119 and OKC 1134 when commercialized and installed by end users will be less likely to sustain winterkill than Tifway in areas that frequently experience low temperatures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems

Outcome #5

1. Outcome Measures

Reduce unneeded fungicide application to bentgrass putting greens

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A number of serious diseases attack bentgrass putting greens across the US and world. Fungicides are very expensive and they pose off target environmental risk. A reliable method of prediction of the need for fungicide applications is needed to both control putting green diseases and reduce the number of unnecessary applications.

What has been done

To improve management recommendations and promote wise-use of fungicides, researchers developed weather-dependent predictive algorithms using risk indices and linear regression techniques to predict infection periods for several bentgrass putting green pathogens. Independent validation studies (studies not used in the model building process) were conducted in 2009 and 2010.

Fungicide protection was predicted during all periods when significant dollar spot events were recorded. If these had been actual trials rather than dramatizations, the advisory would have

resulted in a significant savings in the number of fungicide sprays in both locations as compared to a traditional, calendar-based 14-day spray program. In Oklahoma alone, three and six fungicide sprays could have been saved over the 2009 and 2010 growing seasons, respectively.

Results

Successful results in preliminary modeling allowed researchers success in obtaining USGA funding for a two-year study to validate the model in diverse locations around the country including Oklahoma, Mississippi, Pennsylvania, California, Wisconsin, and Tennessee. This research will result in the development of a new and improved disease advisory for recommending fungicide applications for dollar spot management. This advisory will be much more accurate than previous advisories because it uses regression-based models and temperature and relative humidity as inputs rather than rainfall. The improved accuracy, ability to use the advisory throughout the United States, and speed at which a recommendation can be obtained from the system will result in more timely applications of fungicide and reduce unnecessary fungicide applications. This will improve the control of dollar spot, which translates to improved golf playing conditions, and will reduce the amount of unnecessary fungicide applications. By reducing fungicide applications turfgrass managers can save money (hundreds of dollars per acre per application) and reduce the negative environmental and human effects that often coincide with pesticide use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Two Oklahoma Sod producers went out of business in 2010. This was due to one retirement and one business closure. An expected 5 bankruptcies did not occur due to a temporary but substantial increases in common bermudagrass sales due to the worst winter kill of golf course, lawn and sports field turf since the spring of 1990. Sod sales are projected to return to low levels in 2011 due to a slow construction market. Adoption of new varieties is expected to be minimal in 2011. Widespread loss of creeping bentgrass on putting greens in the southern US spurred the conversion of putting greens on 3 golf courses from bentgrass to ultradwarf hybrid bermudagrass.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Evaluation Results

The Oklahoma Turfgrass Conference represents the largest single educational event of the OSU Turfgrass Team. In a post-conference survey of 2010 attendees, 93% of conference attendees said they would consider attending the 2011 conference while 7% were unsure. Eighty percent of attendees felt education at the conference left them with knowledge such that they could better manage their facility. Seventy percent of attendees felt the knowledge gained would help them manage turf in a more environmentally conscience manner while 10 % felt the opposite. Only 47% of attendees felt that increased knowledge would allow them to save their employers money in the future. Of the attendees that felt the increased knowledge would allow them to save their employers money, 58% felt the savings would be from 0 to 5%, 33% felt the savings would be in the 5 to 10% range and 8% felt the savings would be more than 10%. Ninety percent of attendees felt that knowledge gained from this or a previous Oklahoma Turfgrass conference would allow them to maintain higher quality turf. Fifty-seven percent of attendees had cut fertilizer and pesticide inputs during the 2010 growing season.

Key Items of Evaluation

Post education session survey of attendees intent to adopt or continue to use complicated arrays of new Best Management Practices presented during educational workshops. Perception of attendees concerning whether or not the adoption of the most recent BMPs led to a net savings in overall management costs for their employers, whether the information presented at the workshop will help the employee better manage turfgrass problems, whether or not employment of the information presented will results in a net decrease of fertilizer or pesticide usage by the business.