

NCERA221 2013 Annual Report

Meeting Minutes

NCERA 221: Turf and the Environment

6 Nov., 2013 – In conjunction with the Crop Science Society of America Meetings:
Tampa Florida (8:00-9:30 AM-Marriott Tampa Waterside)

Agenda Items:

1. Meeting minutes and Agenda: The minutes for the 2012 meeting and the agenda for the 2013 meeting were accepted
2. State reports:
 - a. The group was reminded to please submit their state reports to Aaron Patton (ajpatton@purdue.edu) so that they could be submitted by the Dec. deadline, as of this meeting reports had only been received from CDGA, NDSU, KSU, Mich State, Univ. MO and Univ. MD.
 - b. The group was also reminded to please list any regional research or extension publications in their reports. Some in the group has asked if the 2012 report had these included or not? It was uncertain if this was the case. There is a follow up to the 2nd L.I.S.T. study that should be published soon in ATS.
3. Status of existing projects
 - a. Dollar spot project: An update from this multi-state research project is included in the electronic communication for this meeting. It was suggested that perhaps someone in the group should take the initiative to try and go through the data from all the different sites and attempt to generate a publication from this project.
 - b. Cool-season lawn grass color response to fall applied N: Good participation across the region has occurred for the past two years and a poster highlighting those results is being presented at the Wed. afternoon C-5 poster session. Kevin Frank (MSU) and Cale Bigelow (Purdue) are continuing the study for a final fall (2013) on both turf-type tall fescue and Kentucky bluegrass. The project will be complete in spring 2014 following green-up with the hope of trying assemble the data for publication sometime in 2014.
4. Outcomes
 - a. A document was attached to the meeting minutes that outlined the required outcomes for the NCERA-221 project. The group was reminded to please send the chair any additions, deletions or revisions by 10 November. Ideally any joint projects showing collaboration would be desirable.
5. Web-site update
 - a. NCERA 221 web-site (Jared Hoyle-KState) Jared shared that there was an issue with the site, which was hacked and held "hostage". It was shared that we could potentially migrate the site to something within K-State but that there might be issues trying to update it for people

that are external to K-state. Further review will continue and an update will be brought to the summer 2014 meeting. A discussion was then held about why do we even have a web-site? Is it necessary? Does anyone even visit this site? There was some uncertainty about whether the group was required to have one due to NCERA by-laws. If we are not required to have one the group felt there was no need to keep one that receives potentially limited use.

- b. Lawn Problem Solver web-site: The group discussed the Lawn Problem Solver web-site that was put together several years ago. Several members were unaware that we had created this site (Dr. Christians was kind enough to share the site and the contents on his iPad). It was unclear who had created the site (likely Ron Calhoun) and the site still has some merit, but could use some updates. It was suggested that each program link to this site from their state/program web-site. A request was made to see how many "hits" this site has received in recent years.
- c. Regional Extension Publication Master List: An update email was forwarded from Pete Cookingham on being able to create this list in TGIF. Since TGIF already records those materials it is easily possible to just tag the appropriate TGIF records and create a dynamic table of them. If some are not in TGIF Pete would like to get them anyway. The group simply needs to ask him to help with this.
- d. Growing Degree Tracker website: The group discussed the success of the gddtracker.net web-site and the recent expansions of this site to include more locations and potentially more content. It appears that "sponsorship" costs about \$1,200 annually. Several organizations continue to be supportive of this site. Kevin Frank indicated that MSU is still willing to host the site and that there is potential for other models to be included in the site. It was requested that perhaps the insect emergence models be evaluated as they may need some slight modifications.

6. Discussion of collaborative projects

- a. New L.I.S.T. study? The interest in a new study for 2014 was discussed, and many of the group felt this was not a priority. Along that discussion came a conversation about partnering with state Department of Transportation agencies led by Eric Watkins. There was some discussion about the potential for a regional study perhaps evaluating species for road-side utility turf situations. In many states the specifications for seeding are very poor and could use being rewritten. Some ancillary studies that may be of interest would be grasses that tolerate road salt conditions (MN) and interests in non-invasive species as well as plant material that did not attract wildlife. Eric asked that if people were interested to please email him.
- b. Other projects? Several additional potential project ideas were discussed. These included perhaps working with climate based

controllers for helping determine irrigation scheduling, turf needs (Kelly Kopp-Utah State). Kelly Kopp also discussed her involvement in e-Extension related to water use and an effort to provide regionally relevant information about products for water conservation. This concept is evolving. Mark Carroll (MD) discussed his participation with some of the projects related to the Chesapeake Bay Watershed and lawn nutrient issues. He and others briefly discussed perhaps some needs for projects related to compost use in turf. The thought of perhaps evaluating hydrophobic soil conditions was also considered. Xi Xiong (Univ. MO) has some interest and is working in this area. Contact her if you have further ideas/interest.

- c. Additional updates: Dr. Christians briefly spoke about his experience with “biochar” projects and the feasibility of this product as a soil amendment. Apparently there are some cost challenges.
- d. Thoughts on developing “Regional Turfgrass Cultivar Recommendation Lists”: Dr. Patton (Purdue) has offered to take the lead on this idea. These lists were discussed by the group and several Extension specialists weighed in on their past and current experiences with these kinds of lists and the challenges associated with creating and maintaining as well as some of the potential politics involved. One of the biggest concerns was that over the years seed availability for good performing or recommended cultivars can be quite variable. Meaning that perhaps a cultivar is on the “list” but people simply don't have access to the seed. Ultimately the overall feeling from the group was that these lists would be quite difficult to put together and actually keep up to date. It was suggested, that using some web-sites like unitedseed.com can be one place to find cultivars of particular interest and if they might be available.

7. Historian report: Nick Christians (ISU) – a report was submitted electronically.

8. Other items for the group

- a. Kevin Frank relied a request on behalf of Pete Cookingham from the MSU-Turffiles library that if you have a physical (hard-copy) and electronic copy of any past/current field reports could you forward those along to him for archiving.

9. Future meeting site locations

Year	Host Institution/Location	Chair/Host	Secretary
2014	Purdue – West Lafayette	Patton	Shi-Zhang Fei
2015	Iowa State	Shui-Zhang Fei	Branham/Nangle
2016	Univ. Illinois – CDGA	Branham/Nangle	Hoyle
2017	Kansas State	Hoyle	Xi Xiong

2018	Univ. Missouri	Xi Xiong	TBA
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Purdue will host the NCERA-221 meeting in 2014. Tentative dates are currently 17-19 June. It will be held at the West Lafayette campus and there is interest by the group for seeing turf plots. More details such as hotels, etc. will be forthcoming.

The list of future meeting site locations was then discussed. Dr. Christians mentioned that S. Fei will co-ordinate and host this meeting. It was recognized that some new members from institutions not previously part of this group are now participating in this project (Univ. Maryland, Cornell Univ., Utah State Univ.) and that perhaps it may make sense for some of these institutions to be inserted into the list of sites in the near future since many of the current group have not had the chance to see the facilities or interacted as much with these colleagues.

Meeting adjourned.

Submitted: C. Bigelow – Purdue Univ.

In attendance: Cale Bigelow (Purdue), Mark Garrison (WI-Madison), Zach Reicher (Univ. NE-Lincoln), Kevin Frank (Michigan State Univ.), Marty Petrovic (Cornell Univ.), Xi Xiong (Univ. of MO), Alex Williams (for Dr. Michael Barrett – Univ. of KY), Mark Carroll (Univ. of MD), Nick Christians (Iowa State Univ.), Kelly Kopp (Utah State Univ.), David Gardner (Ohio State Univ.), Ed Nangle (Chicago District Golf Assoc.), Bill Kreuser (Cornell Univ.), Jared Hoyle (Kansas State Univ.), John Stier (Univ. of TN), Eric Watkins (Univ. of MN),

**NCERA221: Turfgrass and the Environment, future meeting
2014 Agenda**

We are planning on meeting the week of June 17-19 in West Lafayette, IN at the William H. Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN. Prior to this meeting we will organize a conference call to initiate ideas for projects and assign “homework” to help us develop these ideas more fully prior to the meeting in June. At the meeting, research teams will be assembled for at least 2 regional projects. Additionally, we will further develop the idea of hosting our Regional Extension Publication Master List on the TGIF server. There will be opportunities for presentations summarizing the results of our past projects as well as current research, extension, education activities.

**NCERA221 Regional Research Committee
HISTORIAN'S REPORT**

Nick Christians
November 6, 2013 Tampa, FL

Following is the Historian's Report for the NCERA221 (formerly NCR-10, NCR-192, and NCERA192) Regional Research Committee. Its purpose is to maintain a record of meeting sites and officers of the NCERA221 committee.

Year	Meeting Site	Chairperson	Secretary
<u>PROPOSED SITES</u>			
2018	Missouri	Xi Xiong	To be announced
2017	Kansas	Jared Hoyle	Xi Xiong
2016	Illinois	Branham/Nangle	Jared Hoyle
2015	Iowa State	Shui-Zhang Fei	B. Branham/Nangle
2014	Purdue	Aaron Patton	Shui-Zhang Fei
<u>HISTORICAL SITES</u>			
2013	ASA-CSSA-SSSA	Patton/Bigelow	
2012	Joint meeting with WRC-11 in Corvallis, Oregon	Zac Reicher	Aaron Patton
2011	Joint meeting with WRC-11 at Ft. Collins, CO (Nebraska co-host)	Zac Reicher	Cale Bigelow
2010	Southern Illinois	Ken Diesburg	Cale Bigelow
2009	Michigan	Kevin Frank	Ken Diesburg
2008	Ohio State	David Gardner	Kevin Frank
2007	Wisconsin	John Stier	David Gardner
2006	North Dakota	Ron Smith	John Stier
2005	South Dakota	Leo Schleicher	Ron Smith
2004	Nebraska (Joint with WRC 11)	Gerald Horst	Leo Schleicher
2003	Minnesota	Brian Horgan	Gerald Horst
2002	Missouri	John Dunn	Brian Horgan
2001	Kansas	Jack Fry	Barb Corwin
2000	Glenview, Ill.	Bruce Branham	Jack Fry
1999	Michigan State University	Jim Baird	Bruce Branham
1998	Iowa State University	Dave Minner	Jim Baird
1997	Purdue University	Clark Throssell	Dave Minner
1996	Colorado State (joint WRC-11)	Clark Throssell	Tom Voigt
1995	University of Wisconsin	Frank Rossi	Clark Throssell
1994	Southern Illinois Univ.	Ken Diesburg	Frank Rossi
1993	Palm Beach Florida	Karl Danneberger	Ken Diesburg
1992	Ohio State University	Karl Danneberger	Ken Diesburg
1991	University of Minnesota	Don White	Karl Danneberger
1990	University of Nebraska/ Joint meeting with WRC 11	Roch Gaussoin	Don White
1989	Kansas State University	Jeff Nus	Roch Gaussoin
1988	University of Illinois	David Wehner	Jeff Nus
1987	University of Missouri	David Minner	David Wehner/Tom Fermanian
1986	Michigan State University	Bruce Branham	David Minner
1985	Iowa State University	Nick Christians	Bruce Branham/Paul Rieke
1984	Purdue University	Bill Daniel	Nick Christians
1983	Beltsville Maryland (Joint NCR-10, WRCC-11, NE-139 meeting)	Bob Carrow	Bill Daniel and Ray Freeborg
1982	Ohio State University	Keith Karnok	Bob Carrow
1981	University of Minnesota	Don White	Keith Karnok
1980	University of Nebraska	Bob Shearman	Don White
1979	University of Illinois	A. J. Turgeon	Bob Shearman
1978	Kansas State University	David Martin	A. J. Turgeon
1977	St. Louis, MO	Ed Kinbacher	David Martin
1976	St. Louis, MO	K. T. Payne	E. J. Kinbacher

1975	Indianapolis, IN	C. Hodges	K. T. Payne
1974	Indianapolis, IN	J. H. Dunn	C. Hodges
1973	St. Louis, MO	P. E. Rieke	J. H. Dunn
1972	Fort Mitchell, KY	R. W. Miller	P. E. Rieke
1971*			
1970	Monticello IL	R. C. Newman	R. W. Miller
1969	Chicago, IL	R. C. Newman	A. E. Dudeck
1968	Chicago, IL	J. B. Beard	R. C. Newman
1967	East Lansing, MI	J. D. Butler	J. B. Beard
*	No meeting in 1971; a joint meeting between NCR-10 and the NE group was planned for summer but never took place because of scheduling conflicts.		

NCERA221 Outcomes and DRAFT Actions to Date (10/31/13)

Outcome 1: Generate quantitative data related to the water and nutrient use (including carbon) for the widely planted turfgrass species and cultivars used for lawns throughout the North Central region. Impact: A greater public awareness of best management practices to responsibly implement supplementary irrigation and fertilization practices for the largest turf acreage, lawns. Additionally, these data will provide information to regulatory groups and policy makers not only in the North Central region but analogous cool-humid region states like those surrounding the Chesapeake Bay and New Jersey which have instituted water and nutrient restrictions.

Actions to date:

1. Michigan State (Frank): Long term nutrient leaching
2. Michigan State (Frank): Nitrogen carrier in three rootzones
3. OSU, MN, MI: Correlation and calibration of the Illinois soil nitrogen test for use as a nitrogen fertility management Tool
4. PU (Bigelow) and other state: Effectiveness of fall nitrogen fertilization based on geographic location
5. PU (Patton): Influence of cultivar selection and clipping return on soil labile carbon and CO₂ flux
6. PU (Patton): Influence of turf species on greenhouse gas fluxes
7. Utah (Kopp): Evaluation of climate based irrigation controllers

Outcome 2: Update the suggested list of recommended species and cultivars for very low maintenance use areas in the North Central region. Impact: For very low maintenance areas such as roadside turf, this type of information regarding adapted and persistent turf species is extremely valuable to state highway departments. Ultimately resulting in fewer re-planting needs, less invasive plants, lower maintenance costs and ultimately less taxpayer money being used for roadside maintenance. •

Actions to date:

1. Minnesota (Horgan): Defining low input golf course fairways and putting greens
2. Minnesota (Watkins): marketing low input turfgrasses, breeding rust resistance, fertilizer programs for grass seed production, fine fescues for golf course fairways
3. Southern Illinois: Low input establishment of zoysia
4. Purdue (Bigelow): Maintaining lawn turf with reduced nitrogen inputs

Outcome 3: A list of commercially available bentgrass cultivars highly resistant to dollar spot will be distributed to golf turf managers. Impact: If selected and this will reduce golf course managers reliance on chemical fungicides for suppression of this problematic disease and provide improved playing conditions.

Actions to date:

1. NDSU and others: Evaluation of dollar spot in creeping bentgrass.

Outcome 4: A listing of regionally produced and available biological, landscape and industrial-waste materials intended for turf use will be compiled. Impact: The performance and effects of these

products on turf areas and soil health will be assessed providing more detailed information to those wishing to manage turf using naturally occurring products. •

Actions to date:

1. Wisconsin: Improving the economic and environmental sustainability of sod production using biosolids

Outcome 5: Professional turf managers will be using computer generated decision aids like the web-based regional growing degree day tracker to determine optimum pesticide application timing.

Impact: Improved product efficacy and fewer pesticide applications.

Actions to date:

1. Michigan: GDD Tracker-used in MI, IN, IL, OH
2. Michigan Turf Disease: MSUturfdisease.net
3. Purdue Turf Cast

Outcome 6: The feasibility of non-synthetic pesticides for insect, weed and disease suppression or control will be provided as a new management option. Impact: This will result in reduced reliance on synthetic materials for turf pest control and less chance for non-target effects of these materials. a. Milestone: Field assessment of the performance of naturally occurring products like mustard or entomopathogenic nematodes will continue in 2011, with wider regional evaluation and testing in subsequent years.

Actions to date:

1. OSU (Gardner): Natural products for weed and insect control
2. Missouri (Xi): Organic disease control
3. Kansas (St John): Long-term comparison between corn gluten, urea and milorganite for crabgrass control
4. PU (Patton): Organic control of broadleaf weeds
5. PU: Studies on the influence of Neotyphodium endophytes, Below-ground herbivory and environmental stress on performance of tall fescue and Kentucky bluegrass
6. PU: Influence of nitrogen fertility, surfactants, thatch and the availability of host insects on infectivity and persistence of the entomopathogenic nematode *Heterorhabditis bacteriophora*
7. PU: IPM for white grubs on golf courses: clarifying biological and economic trade-offs
8. PU: Improving integration of cultural and biological controls for managing turfgrass insects
9. *Refereed Publications*
 - a. Blubaugh, C.K., V.A.Caceres, I. Kaplan, J. Larson, C.S. Sadof and D.S. Richmond. 2011. Ground beetle (Coleoptera: Carabidae) phenology, diversity, and response to weed cover in a turfgrass ecosystem. *Environmental Entomology* 40: 1093-1101.
 - b. Baldauf, M.W. W.J. Mace and D.S. Richmond. 2011. Endophyte-mediated resistance to black cutworm as a function of endophyte strain in tall fescue. *Environmental Entomology* 40: 639-647.

Outcome 7: The invasive potential of various turfgrass species in native areas will be assessed and management strategies for the suppression and control of these plants monitored. Impact: Less risk of non-desirable plant species entering native areas and less money being spent on control efforts. a. Milestone: A Wisconsin study has already benchmarked the plant populations in some local areas. As early as 2011 similar areas in surrounding states may also participate.

Actions to date:

Outcome 8: Suppression and reductions in annual bluegrass populations in recreational turf areas. Impact: Improved persistence and performance of more desirable turf species and less money being spent disease control, irrigation and fertilizer needs on this less persistent species. a. Milestone: Field screening of commercially available industry standard annual bluegrass suppression/control products will continue. The emergence of novel chemical products will be assessed for their efficacy and safety when applied to turf areas.

Actions to date:

1. MO: Evaluation of methiozolin safety and efficacy applied as pre- or post-emergence herbicide
2. PU: Putting green annual bluegrass population dynamics as affected by flurprimidol, fertilizer and soil surfactants
3. PU, NE: Timing and rate of methiozolin for greens height annual bluegrass control
4. IL, NE: Ami+Meso for controlling annual bluegrass in KBG/PRYE fairways
5. NE, PU, MI: Controlling *Poa annua* on putting green height turf in Indiana, Michigan, and Nebraska
6. NE, IA: Summer interseeding and aggressive post-seeding herbicides to reduce annual bluegrass in fairways
7. NE, IL: Amicarbazone and mesotrione for annual bluegrass control (NE, IL)
8. Kentucky: Identification and management of annual bluegrass biotypes on golf greens
9. NE, PU, IL: Systems approach to *Poa annua* control on putting greens in Indiana, Illinois, and Nebraska

Outcome 9: A comprehensive list of outreach publications containing information related to turfgrass management in the North Central region will be developed. Impact: This single location of turfgrass management topics will enable those searching for fact-based information on turf management to easily find content appropriate for their situation and more quickly implement best management practices. a. Milestone: The list of state outreach publications regarding turfgrass management is currently being compiled. This list will be located and accessible on the NCERA-192 website.

State Reports:

NCERA 221

- Chicago District Golf
- Cornell
- Illinois.....
- Iowa State
- Kansas State.....
- Kentucky.....
- Maryland
- Michigan State.....
- Minnesota
- Missouri.....
- Nebraska (also WERA 11)
- North Dakota State
- Ohio State
- Purdue
- South Dakota State
- Southern Illinois
- Wisconsin
- Utah State (also WERA 11).....

BRIEF State Report for NCER221

University: Chicago District Golf Assoc. (not-for-profit).

Email: enangle@cdga.org

Phone: 630-685-2307 office, 630-423-1925 cell

Research

FACULTY MEMBER: EDWARD NANGLE

Other notable research projects led by faculty member:

Title: Evaluation of aerobically produced biosolids for use in rough height turfgrass.

Description: Evaluation of possible product that could be used in turfgrass rough areas for nitrogen source with consistent prill size and nitrogen release.

Collaborators (name, institution): P.I. David Gardner Ohio State; Cale Bigelow Purdue University

Brief comments on general turf research: Turf program focus on fungicide testing for several major diseases of cool-season turf: Dollar spot, brown patch, fairy ring, microdochium and Waitea patch. Will broaden research out as required by superintendents in locale, especially if evaluation of new cultivars required where renovation/construction planned.

Extension Program

Collaborating with other organizations on conference: Yes, Univ of Illinois and Southern Illinois Univ

Research field day held (yes/no): No

If so, when:

Where:

Attendance figure:

Note: Will return next year (2014) as we return to full speed on position.

Other Extension activities:

Speaker at State Turfgrass Field Day: Topic: Turfgrass pigments

- University of Illinois Turfgrass Research Field Day. Aug 19, 2013. Urbana, IL.

Speaker at regional superintendent meetings:

- ITF and the Northwest ILGCSA Summer Play day. Jul 8 2013. Shade management

Speaker at State Winter Education Conferences:

- Ohio Turfgrass Foundation (2013), Columbus OH Dec 3-5 2013. Pigments

Newsletter: Scouting Report (pdf) with circulation 400. Approximately 35 are written per growing season (Mar to Nov). Summarizes 3 categories (weather, diagnostics, research). Aids identification/understanding of current pest issues and issues related to abiotic causes of physiological decline. Notes issues that have arisen in the past week and discusses options for course management

Web (yes/no): yes www.cdgaturf.org

FaceBook/Twitter/social networking (yes/no): yes FaceBook: Ed Nangle Twitter: TurfResearch

Brief comments on Extension: Currently provide rapid diagnostic support as a member benefit. CDGA member clubs now number 425 with a majority (300) located in the greater metropolitan Chicago area.

Staffing:

Additions: Current – Vacant – in hiring process. Manager of Turfgrass Research. CDGA Turf Program conducts extensive fungicide and herbicide testing, cultivar trials of cool-season turf.

Responsibilities: Manage turf research from applying trts to collecting data, compiling data and statistical analysis. Reports on select research project in the weekly Scouting Report newsletter.

Retirements/vacancies: We will continue to offer a turf research internship as of summer 2014.

General turf program comments

Employment: 2013-current. Director of Turfgrass Programs – Chicago District Golf Assoc. Turfgrass Program began with the hire of Dr. Randy Kane in 1985. This was followed by Dr Derek Settle in 2006 who served excellently until early 2013. Took over in position May 2013 and have been running ever since.

Scope of Work: Had served 390 golf courses until recent addition of Southern Illinois Golf Assoc. via a friendly merger of services in 2011. New total membership is approximately 425 golf courses. Primary duties are to help superintendents identify disease problems via on-site diagnostic visits. To better understand how to control diseases and other pest problems we conduct extensive field research and product testing to determine best management practices to promote healthy turf, and to oversee CDGA educational programs related to turfgrass science. Supervise a Manager of Turf Research. Assist the management of 3-hole Sunshine Course with golf course superintendent Chris Painter and continue to develop ongoing research on the course. Aiming to continue to publish research with collaborative projects planned here and in Ireland and New Zealand on *Poa annua* bentgrass surfaces.

Professional Objective: To help golf course superintendents learn and utilize turfgrass science through an extension outreach program that utilizes diagnostics, field research and communication. My overall goal is to reach superintendents by communication that is well-timed and broad-based. We continue 'classic' extension by using grant-in-aid research dollars as a way to provide on-site diagnostics without any fee (allows a broader audience of courses to benefit both public and private). Increase profile of the position to have model organization driven by golfers thus avoiding the issue of superintendent funding which can be used elsewhere.

BRIEF State Report for NCERA211 (formerly 192)

University: Iowa State

Official NCERA rep: Nick Christians

Email: nchris@iastate.edu

Phone: 515-294-0036

Teaching

Current undergraduate enrollment: 45

Trend in undergraduate enrollment over last 3 years: down

Placement: excellent

Joint teaching activities with other regional collaborators in the last two years: Began web based turf course taught fall and spring. Nick and Shuizang are now part of the Master of Agronomy web based program.

Research

Faculty member (complete for each faculty member):

Current or recently graduated graduate student:

MS or PhD: Marcus Jones, Ph.D. May 2011.

Project(s):

Graduation date:

Ying Feng, PhD, August 2013, Major Professor: Shui-zhang Fei

Projects: Genomic and genetic studies of environmental control of *Brachypodium* growth and development

Nick Dunlap and Zach Simons completed MS in 2012.

Klingenberg M.T., D. Li, N. E. Christians, and C. J. Blume 2013. Core Aeration Programs and Sand Topdressing Improve Creeping Bentgrass Fairways. *International Turfgrass Journal*. 12:

Law, Q.D., M.A. Jones, A. J. Patton, and N. E. Christians. 2013. Influence of an amino acid complex on the growth of *Agrostis stolonifera* L. cv. Penncross. *International Turfgrass Journal*. 12:

St.John, R.A. and N.E. Christians. 2013. Basic Cation Saturation Ratio Theory Applied to Sand Based Putting Greens. *International Turfgrass Journal*. 12:

Jones, M.A. and N.E. Christians. 2013. Effect of Shoot Density on the Recuperative Potential of Creeping Bentgrass Cultivars. *International Turfgrass Journal*. 12:

Dunlap, N.J., Boersma, N.N., and N.E. Christians. 2013. Enhanced herbicidal activity of corn gluten meal through pH modification. *International Turfgrass Journal*. 12:

Watkins, E., D. Gardner, D. Soldat, R. St. John, J. Stier, N. Christians, A. Hathaway, K. Diesburg, S. Poppe, R. Gaussoin. 2013. Cultivar Performance of Low-Input Turfgrass Species for the North Central Region. *Applied Turfgrass Science* (scheduled for publication)

St. John, R. A.; Christians, N. E.; Liu, H.; Menchyk, N. A. 2013. Secondary nutrients and micronutrient fertilization. In: Stier, John C.; Horgan, Brian P.; Bonos, Stacy A.; Schmitt, Gail K., eds. *Turfgrass: Biology, Use, and Management*. Madison, Wisconsin: American Society of Agronomy. p. 521-543.

Jones, M., N.E. Christians, and I. Mertz. 2014. Impact of plant growth biostimulents on creeping bentgrass growth. In press *ACTA Horticulturae*.

Hao J, Yin Y and Fei S 2013. Brassinosteroid signaling network: implications on yield and stress tolerance. *Plant Cell Reports*. DOI 10.1007/s00299-013-1438-x

Extension

State conference dates: January 28-30th 2014

Collaborating with other organizations on conference (yes/no): Yes

If so who: Iowa Turfgrass Institute, Iowa GCSA, ISTMA and IPLCA

Attendance figure: 900-1000

Research field day held (yes/no): Yes

If so, when: August 1st, 2013

Attendance figure: 120

Other Extension activities: I have given several presentations to groups such as Iowa Master Gardeners, Federated Garden Club of Iowa, and chapters of the Iowa GCSA/ISTMA. I will also be speaking at the upcoming Heart of America GCSAA Common Ground Conference and Iowa Turf Conference. Several extension visits have been made through-out Iowa in the last two months. One of current activities is revising out of date publication and creating new articles. There are also weekly article contributions to the IA turf blog.

Web (yes/no): Yes

FaceBook/Twitter/social networking (yes/no): Yes – Twitter, Blog at

<http://iaturf.blogspot.com/>, as well Nick Christians Facebook to circulate information.

Joint Extension publications with other regional collaborators in the last two years: No joint extension publications

Extension Publications:

Adams, R.S., and N. E. Christians, 2013. PM 1072: Establishing a lawn from seed. Iowa State Extension Store. Previously revised by Michael Agnew, extension turfgrass specialist from materials originally prepared by Norman Hummel, former extension turfgrass specialist, and Nick Christians, associate professor of horticulture.

Adams, R.S., and N. E. Christians, 2013. PM 1057: Lawn Fertilization. Iowa State Extension Store. Previously revised by Dave Minner, professor of horticulture. Prepared by Norm Hummel, former extension turfgrass specialist; reviewed by Michael L. Agnew, extension turfgrass specialist.

Staffing:

Additions: Nick Christians 50 teaching 50 research

S. Fei 25% teaching, 75% Research

D. Minner

Ryan Adams Turf Extension/Lecturer, began August 2013.

Responsibilities:

Retirements/vacancies: none

General turf program comments Funding reductions have seriously affected the turfgrass program.

Fei obtained funding from USDA/NIFA to study switchgrass and from the Gates Foundation to develop curriculum for African Universities.

[BRIEF State Report for NCER221](#)

University: Kansas State University

Official NCERA rep: Jared A. Hoyle

Email: jahoyle@ksu.edu

Phone: 785-532-1419

Teaching Program

Current undergraduate enrollment: 53

Trend in undergraduate enrollment over last 3 years: downward

Placement: excellent

Brief comments on teaching: We are in the process of making our turf courses available via distance education. We offered "Basic Turfgrass Culture" (2 cr.) and "Intensive Culture of Golf and Sports Turf" (1 cr.) for the first time this spring, and will be offering "Turfgrass Disease Management" (1 cr.) and "Turfgrass Weed Management" (1 cr.) this fall. "Turfgrass Science" (3 cr.) and "Turfgrass Insect Management" (1 cr.) will follow in Spring, 2013 and Fall, 2013, respectively.

Research

[FACULTY MEMBERS: JACK FRY AND DALE BREMER](#)

Current or recently graduated graduate student: Tony Goldsby, PhD

Project(s): (1) Response of Kentucky Bluegrass Cultivars to Prolonged Drought in the Transition Zone.

(2) Evaluation of Turf Reinforcement Mats and Their Effect on Establishment of Buffalograss.

(3) Zoysiagrass Utilizing Hyperspectral Radiometry to Predict Green Leaf Area Index of Kentucky Bluegrass.

Graduation Date: May 2013

Current or recently graduated graduate student: Kenton Peterson, PhD

Project(s): (1) Long-Term Changes of Selected Zoysiagrass Grown Under Dense Shade.

(2) Comparing ET Measurement Techniques in Turfgrass

(3) Evaluation of Atmometers within Urban Home Lawn Microclimates

Graduation Date: August 2013

Current or recently graduated graduate student: Josh Chabon, M.S.

Project(s): Impact of irrigation scheduling on nitrate leaching and mowing requirements in tall fescue

FACULTY MEMBER: STEVE KEELEY

Current or recently graduated graduate student: Zane Raudenbush, PhD

Project(s): Silvery thread moss biology and management

FACULTY MEMBERS: MEGAN KENNELLY AND JACK FRY

Current or recently graduated graduate student: Cole Thompson, PhD

Project(s): Physiology and Pathology of Rough Bluegrass Decline

Current or recently graduated graduate student: Ross Braun, M.S.

Project(s): Managing large patch and winter color of zoysiagrasses in the transition zone

Collaborators (name, institution): Patton, Purdue; Chandra, Texas A&M

FACULTY MEMBER: MEGAN KENNELLY

Current or recently graduated graduate student: Jesse Ostrander, M.S.

Project(s): Sensitivity of Kansas isolates of *Sclerotinia homoeocarpa* to sterol demethylation inhibitor fungicide

Current or recently graduated graduate student: Ross Braun, M.S.

Project(s): Effect of nitrogen source and timing on large patch in zoysiagrass.

Partner institution: Lee Miller, University of Missouri

Other notable research projects led by faculty member:

Title: Project(s): Nitrous Oxide Emissions and Carbon Sequestration in Turfgrass: Effects of Irrigation and N Fertilization

Collaborators (name, institution): Bremer, KSU; Fry, KSU

Title: Project(s): Late-Season Bermudagrass Control with Herbicide Combinations for Spring Renovation

Collaborators (name, institution): Hoyle, KSU; Thompson, KSU

Title: Project(s): 'Cody' Buffalograss Tolerance to Combination Post-Emergence Herbicides

Collaborators (name, institution): Hoyle, KSU

Extension Program

State conference dates: Dec 3-5 in Topeka, KS

Collaborating with other organizations on conference (yes/no): No

Attendance figure: about 600-800

Research field day held (yes/no): Yes

If so, when: Always first Thursday in August. August 1, 2013 in Wichita, Aug 7 2014 in Manhattan and Aug 6 2015 in Olathe.

Attendance figure: varies by location, average 200-300

Other Extension activities:

- The turfgrass extension specialist (J.A. Hoyle) and the nursery production specialist (C. Boyer) are in the initial stages of testing non-traditional methods for recording extension activities. The objective of this project is to determine; (1) effective methods of record keeping techniques, (2) time consumption of record keeping, and (3) effectively determine locations and specialization areas of contacted audiences.
- A Turfgrass Road Show or other similar outreach program for professional turfgrass managers is in the development stages for the Spring of 2014.

Web (yes/no): yes www.ksuturf.com and www.kansasturfgrassfoundation.org

FaceBook/Twitter/social networking (yes/no): yes: Facebook, KSUTurf and Kansas Turfgrass Foundation (KTF); Twitter, @KSUTurf ; Blog, www.ksuturf.org/blog/

Brief comments on Extension:

- Due to the changes in turf faculty the blog/facebook/twitter activity was lower than usual. Popularity is increasing as well as activity. The turfgrass program is still receiving compliments on the reported information. Turfgrass professionals and homeowners are very appreciative of the relative and timely information. Many of the articles are reprinted in local newspapers (The Wichita Eagle, My Sun Coast), local and national newsletters (TURFNews, GCM's Turf Weekly) and have lead to television interviews and reports.
- The KSU websites are in full flux due to underlying system-wide "migration" but will be rebuilding and enhancing soon.

- The state of Kansas is starting to offer on-line pesticide recertification credits. Industry groups including the Kansas Turfgrass Foundation and the KSU extension programs are recruiting for the use of on-line pesticide recertification. Applicators are not allowed to receive all recertification credits online.

Staffing:

Additions: Jared A. Hoyle, Assistant Professor and Turfgrass Extension Specialist, Manhattan, KS

Responsibilities: 60% Extension, 40% Research

Additions: Undetermined, Full-Time Turfgrass Research Associate (To be hired Nov. 1) and Part-Time Graduate Student

Responsibilities: Assist in Hoyle's Extension and Research Program

Retirements/Vacancies: none

General Turf Program Comments:

BRIEF State Report for NCER221

University: University of Kentucky

Official NCERA rep: Michael Barrett

Email: mbarrett@uky.edu

Phone: Office 859-218-0712, Cell 859-229-1522

Teaching Program

Current undergraduate enrollment: 7

Trend in undergraduate enrollment over last 3 years: Declining

Brief comments on teaching: Job market seems to be improving, we will begin recruiting to attract more students this year.

Research

FACULTY MEMBER: MICHAEL BARRETT

Current or recently graduated graduate student: Alex Williams, PhD

Project(s): Response of Poa biotypes to herbicides and PGRs

Graduation date: 5/2013

Current or recently graduated graduate student: Tara Burke, M.S.

Project(s): Selection and characterization of 2,4-D tolerance in red clover

Graduation date: 5/2014

FACULTY MEMBER: GREGG MUNSHAW

Current or recently graduated graduate student: Brett Sparks, M.S.

Project(s): Low Input Turf

Graduation date: 5/2014

Other notable research projects led by faculty member:

Title: Cold tolerance in bermudagrass

Collaborators (name, institution): Erik Ervin, VPI

Brief comments on research: Looking at enhancing Bermuda cold tolerance with salinity

Title: Dwarf bermudagrass for putting greens

Brief comments on research: Looking at adaptation of dwarf Bermuda in KY

FACULTY MEMBER: DAVID WILLIAMS

Current or recently graduated graduate student: Michael Deaton, PhD

Project(s): Bermudagrass germination and traffic tolerance

Graduation date: 8/2012

Current or recently graduated graduate student: Kenneth Cropper, PhD

Project(s): T phylloplanin on localized dry spot and root infecting fungi

Graduation date: 8/2013

Current or recently graduated graduate student: Whitney Churchman, M.S.

Project(s): Switchgrass establishment

Graduation date: 5/2014

Other notable research projects led by faculty member:

Title: C balance of transition zone lawns

Title: Cultural control of spring dead spot

Title: Simulated traffic devices

Extension Program

State conference dates: 0/15-18, 2012

Collaborating with other organizations on conference: KY Turfgrass Council

Attendance figure: 300 in 2011

Research field day held: June 14, 2012

Attendance figure: 400 in 2011

Other Extension activities: Turf and Landscape Short Course 802 attendees in 2012

Web – yes

FaceBook/Twitter/social networking – yes

Brief comments on Extension: Adding Certified Turf Managers Short Course for January 7-13, 2013. Added workshops to our research field day this year. Updating all publications and adding videos.

Staffing:

Additions: Gregg Munshaw

Responsibilities: 80% Turf Extension, 20% Turf Research

Retirements/vacancies: AJ Powell

General turf program comments

We have added new land, more students, and have greatly expanded the turf research program the past two years. The addition of Gregg Munshaw continues this expansion. We continue close collaborations with Dan Potter in Entomology and Paul Vincelli in Plant Pathology. On the down side, we have real concern about our undergraduate program, both turf specifically and general plant and soil sciences.

BRIEF State Report for NCER221

University: University of Maryland

Official NCERA rep: Mark Carroll

Email:mcarroll@umd.edu

Phone:301-405-1339

Teaching Program

Current undergraduate enrollment: 9 (4-year), 26 (2-year)

Trend in undergraduate enrollment over last 3 years: Stable in both programs

Placement: Undocumented but assumed to be close to 100%

Brief comments on teaching: The Institute of Applied Agriculture within the College of Agriculture and Natural Resources, with the approval of the admissions office, has initiated a program called "College Forward". This program will accept students into the 2 year turf program who have been denied admission to the 4 year turf program. Students who enter into this program and have a 3.0 or higher GPA after their first 30 credit hours will be given preferential admission status into the 4 year turf program as a sophomore. It is our hope that will lead to an increase in the number of students within the 4 year turfgrass program

Research

Faculty member: Mark Carroll

Current graduate student: Siqi Chen M.S.

Project: Use of compost topdressing and compost tea to increase soil infiltration, improve turfgrass quality and reduce lawn fertilization

Graduation date: anticipate Dec 2014

NCERA collaborators on grad projects -none

Current graduate students: Xiayun Xiao, M.S.

Project: Use of compost and microclover to reduce nutrient and sediment runoff from home lawns

Graduation date: anticipate May 2015

NCERA collaborators on grad projects -none

Other notable research projects led by faculty member:

Title: Implementing BMP's to Reduce Runoff and Lawn Fertilizer Use

Description: The investigation and promotion of two potential best management practices (BMPs) for use by the building community to reduce fertilizer use by new homeowners. The two BMP's are the use of a lawn seed mixture containing microclover; and the incorporation of compost during soil preparation. This is a multistate project involving six faculty members from the University of Maryland, Penn State and Virginia Tech. Maryland is the lead institution and is documenting the effect of the two BMP's on stormwater runoff in a new residential development. Project members in Pennsylvania and Virginia are evaluating the effect of the two BMPs and other management practices on soil infiltration and various aspects of turf quality.

NCERA Collaborators (name, institution): None

Publications with other NCERA collaborators over the last two years: None

Faculty member: Tom Turner

Current graduate student: none

Other notable research projects led by faculty member:

1. Effect of N-source, timing, and rate on long-term performance of turf-type tall fescue, weed encroachment, and soil organic matter levels
2. Comparing synthetic versus organic fertilizer and weed control programs and compost tea applications on long-term turf-type tall fescue performance and weed encroachment
3. Maryland evaluations of NTEP trials for bermudagrass, zoysiagrass, low maintenance fine fescue, fairway perennial ryegrass, fairway bentgrass, and low maintenance Kentucky bluegrass.
4. Joint Maryland-Virginia turf-type tall fescue and Kentucky bluegrass cultivar trials, as well as regional perennial ryegrass breeder trials.

Extension Program

State conference dates: January 7, 8 2013

Collaborating with other organizations on conference (yes/no):Yes

If so who : Maryland Turfgrass Council

Attendance figure:450

Research field day held (yes/no): Yes - Lawn &Landscape Contractor field day is in odd years, Golf Course field day in even years

If so, when: Lawn &Landscape Contractor Field day October 23, 2013

Attendance figure: 50

Other Extension activities: Work closely with the MD Department of Agriculture regarding publications and training for state nutrient management regulations. Meet annually with Va. Tech to create joint recommended cultivars list for certified sod production and professional seeding in Maryland and Virginia.

Web (yes/no): extension publications and articles appear on Maryland Turfgrass Council web page

FaceBook/Twitter/social networking (yes/no): No

Brief comments on Extension

Staffing:

Additions:

Responsibilities:

Retirements/vacancies: Peter Dernoeden retired 7/1/2013.

General turf program comments

Turfgrass pathologist search to replace Peter Dernoeden will commence in early 2014

BRIEF State Report for NCERA211 (formerly 192)

University: Michigan State University

Official NCERA rep: Kevin W. Frank

Email: frankk@msu.edu

Phone: 517-355-0271 x 147

Teaching

Current undergraduate enrollment: 70 total, 28 (4 yr.), 42 (2 yr.)

Trend in undergraduate enrollment over last 3 years: 4 yr. program declining, 2 yr. programs flat

Placement: Excellent

Joint teaching activities with other regional collaborators:

Research

Faculty member (complete for each faculty member): **Kevin W. Frank**

Current or recently graduated graduate student: Xingzhe Cai and Xiaojing Zhu

MS or PhD: MS non-thesis

Project(s): non-thesis

Graduation date: May 2013

Other notable research projects led by faculty member:

Title: Long term nutrient leaching

Description: Nitrogen fate research was initially conducted at Michigan State University in 1991. The initial research conducted from 1991 through 1993 indicated that there was minimal risk of nitrate-nitrogen leaching from turfgrass. Subsequent years of research on the same lysimeters indicate the risk of nitrogen leaching changes as the turf ages. Since the summer of 1998 percolate samples have been collected from the same monolith lysimeters and analyzed for nitrate-nitrogen. As of 2011, the turfgrass area has now been under continual fertilization practices for 21 years with percolate collection for the last 13 years consecutively. The mean $\text{NO}_3\text{-N}$ concentration in leachate for the low N rate for the 13 years of data collection is 3 mg L^{-1} . From 2000-2002, for the high N rate, $\text{NO}_3\text{-N}$ concentrations in leachate were often greater than 20 mg L^{-1} . In 2003 the high N rate was reduced to 198 kg N ha^{-1} but the concentration of $\text{NO}_3\text{-N}$ leaching from the high N rate treatment did not decline from the previous years. Since 2004, the average concentration of $\text{NO}_3\text{-N}$ in leachate for the high N rate is 7 mg L^{-1} . This research indicates that leaching potential from continually fertilized turfgrass sites changes due to the age of turfgrass and nitrogen rate.

Title: Management strategies to alleviate winterkill on golf courses

Description: Winterkill injury results in direct and indirect costs for golf courses as putting greens have to be reestablished and golf courses that are severely affected have reduced revenue from numbers of rounds played. This research is investigating management strategies in both the autumn prior to the on-set of winter and during the winter to determine their affect on reducing turfgrass winterkill. The research objectives are to determine the effect of autumn nitrogen, plant growth regulators, topdressing with sand,

topdressing with dark colored materials, and snow removal on winterkill of *Poa annua* and creeping bentgrass putting greens.

Faculty member (complete for each faculty member): **Thomas A. Nikolai**

Current or recently graduated graduate student: Rodney Tocco

MS or PhD: PhD

Project(s): Determining plant available water for sustainable water conservation with ET replenishment regimes, wetting agents, and cultural practices.

Graduation date: Dec. 2013

Description: MSU is currently performing three putting green irrigation studies. Rod Tocco is a Ph.D. candidate running a study to investigate Evapotranspiration (E.T.) and Time Domain Reflectometry (TDRs) as methods to replenish plant available water in a putting green. The research will also investigate the impact of wetting agents and daily double cutting under three different irrigation regimes and how these combine to affect green speed, turfgrass disease, organic matter content, and microbial activity.

Current or recently graduated graduate student: Nick Binder

MS or PhD: MS

Project(s): Athletic Field Rolling Research

Graduation date: Spring 2015

Description: Routine lightweight rolling has become a very common management practice of golf course greens due to many studies that have taken place over the last couple decades. However, there is currently no published research evaluating this practice on athletic fields. This research looks at routine lightweight rolling at its effects on athletic field surface and subsurface characteristics.

Other notable research projects led by faculty member:

Title: The social, economic, and environmental impact of turfgrass in an urban setting.

Description: This research will quantify the social, economic, and environmental impact that well maintained turfgrass has on an urban setting and will define its role as a stimulus for the recovery of neglected neighborhoods and cities.

Faculty member (complete for each faculty member): **John N. Rogers, III**

Current or recently graduated graduate student: Thomas Green

MS or PhD: MS

Project(s): A Combination of Lightweight Rolling and Sand Topdressing Programs to Decrease Pesticide Inputs and Enhance Fairway Turfgrass Quality

Graduation date: Dec. 2013

Description: The objective of this study was to compare turf grown on native soil and sand topdressed areas, and evaluate the effects of season long rolling frequency (one, three, or five times per week) on turf quality and disease severity for a mixed stand fairway of creeping bentgrass (*Agrostis stolonifera* L.) and annual bluegrass (*Poa annua*

L.). No fungicide applications were used on these plots that were maintained at 0.5-in height of cut, and vibratory rollers, attached to a John Deere 2500A triplex mower, were used to administer the rolling frequency treatments. This three year investigation was initiated in July 2011. Turfgrass grown on the sand topdressed areas had less dollar spot incidence and rated higher in quality compared to the native soil areas in 2011.

Faculty member (complete for each faculty member): **David Smitley**

Other notable research projects led by faculty member:

Title: Long-term Management of European Chafer Grubs on Golf Courses and Home Lawns

Description: Grub damage to turf in Michigan has become so common that insecticide sales at garden centers are estimated at over \$10 million each year. Initial research found that the amount of visible turf injury due to grubs may be directly related to the size of the turf root mass. This means that grub damage could be prevented by increasing the mowing height, providing standard fertility, irrigating, or a combination of all three. The research objectives are: (1) Under low maintenance conditions, determine the root mass produced by 6 cultivars each of tall fescue, perennial ryegrass, Kentucky bluegrass and fine fescue, (2) For the same 24 cultivars in objective (1), and also under low maintenance conditions, determine how much the turf root mass increases when the mowing height is raised from 1.5" to 3.5", (3) under natural home lawn conditions determine how much turf tolerance to European chafer grubs is conferred by raising the mowing height from 1.5" to 3.5".

Other notable research projects led by faculty member:

Title: Long-term Management of Japanese Beetle Grubs on Golf Courses and Home Lawns

Description: Recent research by Smitley led to the release of a pathogen (*Ovavesicula popilliae*) which helps to suppress populations of Japanese beetles. *Ovavesicula popilliae* is known to infect Japanese beetles and was found to be present in Connecticut and absent from Michigan. The protozoan pathogen was introduced into research plots at three golf courses in Southern Michigan. Six years after introduction of *Ovavesicula*, we documented a 55% reduction in Japanese grubs along with a significant reduction in egg production. Overall impact provides an average population reduction of 64% per year due to *Ovavesicula*. The natural spread of the protozoan is slow, so to speed up the process Smitley has held Biocontrol field days where golf course superintendents and Michigan residents can pick-up Japanese beetles infected with the protozoan to take back to their own course or lawn.

Faculty member (complete for each faculty member): **Joe Vargas, Jr.**

Current or recently graduated graduate student: Paul Giordano

MS or PhD: PhD

Project(s): A new disease of creeping bentgrass caused by *Acidovorax avenae* subsp. *avenae*.

Graduation date: May 2014

Description: In the summers of 2009 and 2010 the MSU turf pathology lab received samples that exhibited heavy bacterial streaming from diseased creeping bentgrass plants. The bacterium was later identified as *Acidovorax avenae* subsp. *Avenae*. Our research thus far has found significant virulence on numerous different cultivars of creeping bentgrass with select isolates of the bacterium. Additionally, DNA comparisons among isolates obtained from 9 different golf courses indicate seven with *Acidovorax* as the ubiquitous bacterium inhabiting infected host tissues. Golf courses and turf growers in the United States could face serious economic losses if the disease is found to be easily spread and aggressively virulent. Future research will be conducted to gain a thorough understanding of the pathogen epidemiology, biology, infection mechanisms and host range, as well as effective controls.

Current or recently graduated graduate student: Nancy Dykema

MS or PhD: MS

Project(s): The effects of irrigation timing and rates on dollar spot development

Graduation date: Dec. 2013

Description: In an effort to manage dollar spot, possibly with lower fungicide inputs, the effects of irrigation frequency and volume are being studied to determine whether something as simple as managing irrigation can play a role in reducing the incidence of dollar spot. This research study focuses on comparing different irrigation regimes, based on frequency and application volumes, and their effect on dollar spot. In addition, investigations regarding dollar spot resistance levels in three creeping bentgrass (*Agrostis palustris*) cultivars are being studied.

Other notable research projects led by faculty member:

Title: Pesticide Application Risk Reduction Technology for Golf Course and Athletic Field Turfgrass Using Treated Sand Topdressing Technology

Description: Research at MSU suggests that it may be possible to combine the sand topdressing and pesticide application into one efficient operation, using a combination sprayer/topdresser machine. This novel technology should reduce the cost, play disruption, and the environmental impact (fuel use, CO₂ emissions) of these maintenance operations by reducing the number of trips over the turf, especially greens and tees. The potential for operator and bystander exposure to spray drift and volatilization should also be reduced, since the sprays will be applied to the sand in a wind-protected environment on the topdresser, prior to expulsion of the sand to the turf. "Proof of concept" research is underway for the control of turfgrass diseases such as dollar spot and anthracnose, and to expand the utility of this technology beyond fungicides, to fertilizers and other sprayable turfgrass maintenance products.

Faculty member (complete for each faculty member): **Emily Merewitz**

Current or recently graduated graduate student: Kevin Laskowski

MS or PhD: MS

Project(s): Effects of Drought and Traffic Stresses on Physiological Responses and Water Use Characteristics of Creeping bentgrass (*Agrostis stolonifera*) and Annual bluegrass (*Poa annua*)

Graduation date: May 2014

Description: The objectives of the research are to evaluate physiological responses and water use of creeping bentgrass and *P. annua* to different volumetric soil moisture contents (8, 12, and 16%) and traffic to detect whether there are significant differences in water use characteristics, water use efficiencies, rooting, and hormone production.

Extension

State conference dates: Jan. 13-15, 2014

Collaborating with other organizations on conference (yes/no): no

If so who:

Attendance figure: 1,000 (from 2013 conference)

Research field day held (yes/no): yes

If so, when: Aug. 20, 2014

Attendance figure: 500 (from 2013 field day)

Other Extension activities:

Web (yes/no): www.turf.msu.edu, www.msuturf.blogspot.com

FaceBook/Twitter/social networking (yes/no): yes

Joint Extension publications with other regional collaborators:

General turf program comments

BRIEF State Report for NCER221

University: University of Minnesota

Official NCERA rep: Brian Horgan

Email: bphorgan@umn.edu

Phone: 612-624-7496

Teaching Program

Current undergraduate enrollment: <10

Trend in undergraduate enrollment over last 3 years: down (rapidly)

Placement: good

Brief comments on teaching: students that would traditionally come for turfgrass science (now in the Plant Science major) are likely not getting in to the University due to raised admission requirement. We have been teaching cooperatively with UW Madison (one course offered distance by each to the other institution).

Research

Current graduate students

Eric Koeritz (co-advised by Eric Watkins and Nancy Ehlke)

MS or PhD: PhD

Project(s): Seed production management for reducing rust disease / Breeding for rust resistance

Graduation date (est): 2014

Joshua Friell (co-advised by Brian Horgan and Eric Watkins)

MS or PhD: PhD

Project(s): Salt-tolerance of roadside turfgrass mixtures

Graduation date (est): 2014

Garett Heineck (co-advised by Eric Watkins and Nancy Ehlke)

MS or PhD: MS

Project(s): Breeding for increased winterhardiness in perennial ryegrass

Graduation date (est): 2015

Long Ma (advised by Eric Watkins)

MS or PhD: PhD

Project(s): Germplasm improvement of fine fescues

Graduation date (est): 2017

Clemon Dabney (advised by Eric Watkins)

MS or PhD: MS

Project(s): Low-input turfgrass breeding

Graduation date (est): 2015

Ian Lane (co-advised by Marla Spivak and Eric Watkins)
MS or PhD: MS
Project(s): Enhancing pollinator foraging resources in turf systems
Graduation date: 2016

Maggie Reiter (co-advised by Brian Horgan and Eric Watkins)
MS or PhD: MS
Project(s): Fine fescues for golf course fairways
Graduation date (est): 2015

Madeline Leslie (advised by Brian Horgan)
MS or PhD: MS
Project(s): Turfgrass outreach and education for low-input turfgrasses
Graduation date (est): 2015

Recently graduated students

Kari Hugie (co-advised by Eric Watkins and Chengyan Yue)
MS or PhD: MS
Project(s): Low-input turfgrass species as a pest management strategy
Graduation date: July, 2012

Publications with other NCERA collaborators over the last two years:

Watkins, E., D.S. Gardner, J.C. Stier, D.J. Soldat, R.A. St. John, N.E. Christians, A.D. Hathaway, .L. Diesburg, S.R. Poppe, R.E. Gaussoin. 201x. Cultivar performance of low-input turfgrass species for the North Central United States. Applied Turfgrass Science: *Accepted (revision submitted)*

Gardner, D.S., B.P. Horgan and B.J. Horvath. 2013. Spatial variability of soil amino sugar nitrogen on golf course fairways. *Int. Turfgrass Journal*. 12:545-551.

Stier, J.C., B.P. Horgan and S.A. Bonos (ed). 1328 pp. 2013. Turfgrass: biology, use and management. Agronomy Society of America Book Series. Agronomy Monograph No. 56. Madison, WI.

Bauer, S., B.P. Horgan, E. Watkins, A. Hathaway, R. Calhoun, and K. Frank. 2012. Establishment of creeping bentgrass in annual bluegrass fairways using glyphosate and interseeding. Online. Applied Turfgrass Science doi:10.1094/ATS-2012-0127-01-RS.

Extension Program

State conference dates: January 8-10, 2014

Collaborating with other organizations on conference (yes/no): yes

If so who: Minnesota Turf and Grounds Foundation and Minnesota Nursery and Landscape Association

Attendance figure: 6,000

Research field day held (yes/no): yes

If so, when: online (virtual field day)

Attendance figure: n/a

Other Extension activities: turf school, regional turfgrass workshops

Web (yes/no): yes (www.turf.umn.edu)

FaceBook/Twitter/social networking (yes/no): yes

Brief comments on Extension

Staffing:

Additions:

Angela Orshinsky, Assistant Professor, Plant Pathology

Sam Bauer, Turfgrass Extension Specialist

Lindsey Hoffman, Post-doc, Turfgrass Breeding

General turf program comments

BRIEF State Report for NCER221

University: University of Missouri

Official NCERA rep: Xi Xiong

Email: xiongxi@missouri.edu

Phone: 573-882-1824

Teaching Program

Current undergraduate enrollment: 12-18.

Trend in undergraduate enrollment over last 3 years: 10-18

Placement: golf courses, sports fields, lawn-care companies, graduate colleges, and others.

Brief comments on teaching: Introductory Turfgrass Management and Advanced Turfgrass Management have been offered every year in fall and spring semester, respectively. This past year, Introductory Turfgrass Management was taught by Brad Fresenburg, and the Advanced Turfgrass Management was taught by Xi Xiong. This year Brad Fresenburg also offered an Currently an 8-week course on Horticultural Drainage & Irrigation Systems (2 credits) during the spring semester.

Research

Faculty member: Xi Xiong

Current or recently graduated graduate student: Enzhan (Steve) Song

MS or PhD: PhD

Project(s): Soil hydrophobicity and wetting agent application on turf

Graduation date: May, 2017

Current or recently graduated graduate student: John Haguewood

MS or PhD: MS

Project(s): *Poa annua* control on creeping bentgrass putting green

Graduation date: January, 2014

Current or recently graduated graduate student: Xiaowei (Natalie) Pan

MS or PhD: PhD

Project(s): Utilizing plant residues to control turfgrass diseases

Graduation date: December, 2016

Staffing:

Additions: Brett Lowman.

Responsibilities: Field plots management.

Other notable research projects led by faculty member:

Title: Indaziflam safety on bermudagrass (*Cynodon dactylon*) turf influenced by soil texture and organic matter.

Description: We constructed sand and loamy sand soil with various organic matter content and conducted a growth chamber research for evaluation of shoot and root responses of bermudagrass to indaziflam applied at various rates.

Collaborators (name, institution): Jim English (University of Missouri), Reid Smeda (University of Missouri), Steve Anderson (University of Missouri), Keith Goyne (University of Missouri), Carl Sams (University of Tennessee), Justin Moss (Oklahoma State University), Nathan Walker (Oklahoma State University), and Mike Richardson (University of Arkansas).

Research

Faculty member: Lee Miller

Current or recently graduated graduate student: Derek Cottrill

MS or PhD

Project: Suppression of spring dead spot in Missouri with cultural and chemical control practices.

Graduation date: 1/2014

Staffing:

Additions: Daniel Earlywine, M.S.

Responsibilities: Research assistant – fungicide evaluation trials, field lab management

Other notable research projects led by faculty member:

Title: Characterization and management of root infecting *Pythium* diseases on bentgrass putting greens in the Midwest.

Collaborators (name, institution): Jim Kerns, North Carolina State University, Brad Fresenburg, Mizzou

Description: We have 1) obtained and identified 41 *Pythium* spp. from 48 isolates sampled from AR, KS, IL, MO, and OK, 2) initiated greenhouse work to assay the virulence of the isolates, and 3) constructed a 7000 ft² USGA specification research green with 440 individual 27-inch diameter PVC tubes to develop integrated management strategies for *Pythium* control.

Title: Evaluation of fertilizer strategies for preventing or recovering from large patch disease of zoysiagrass.

Description: This USGA funded project, in collaboration with Megan Kennelly at Kansas State, investigates the impact of various fertilization practices and fungicide application strategies for large patch management. Currently looking for a PhD student for this project.

Title: Assessment of host resistance of warm season turfgrass cultivars to disease.

Description: Evaluation of disease resistance in the recent bermudagrass and zoysiagrass NTEP entries to spring dead spot and large patch, respectively. Plots will be inoculated in the fall of 2014 after the first year of establishment.

Brief comments on research:

The project led by Derek Cottrill will be complete in early 2014, with field and laboratory trials assessing the impact of fungicide, pH, and nitrogen source on the spring dead spot pathogen and disease occurrence. We are also investigating aspects of large patch control and occurrence on zoysiagrass in Missouri, including host resistance, pathogen diversity, and maximizing currently available cultural and chemical controls. Two assistantships currently open.

Research

Faculty member: Brad Fresenburg

Current or recently graduated graduate student: None currently

Other notable research projects led by faculty member:

Title: See below.

Description:

NTEP: As you are aware, the 2006 Tall Fescue trial was completed and the new Tall Fescue trial was established in September of 2012. We are also conducting the 2010 Perennial Ryegrass trial. This past summer (2013), in cooperation with Dr. Lee Miller; two ancillary trials were established – the 2013 Bermudagrass trial for Spring Dead Spot Resistance and the 2013 Zoysiagrass trial for Large Patch Resistance. These trials are conducted at the University of Missouri Turfgrass Research Facility approximately 5 miles from campus in a southeast location of Columbia, Missouri.

Extension Program

Faculty member: Lee Miller

Research field day held (yes/no): Yes

If so, when: July 30th, 2013

Attendance figure: 194 in 2013

Other Extension activities for Lee Miller: Diagnostic laboratory/visits, Master Gardener instructor, PAT training instructor, Completed Revision of PAT Training Manual along with Brad Fresenburg.

Web (yes/no): turfpath.missouri.edu – regular weekly – bimonthly disease updates provided throughout the growing season. An email blast drives readers to website where they can be tracked. From Jan 2013 to present, the site has had over 7,505 unique page views with an average time of 1:49 spent per page.

FaceBook/Twitter/social networking (yes/no): @muturfpath

Brief comments on Extension

The diagnostic lab was moderately busy in 2013. In 2014, the Mizzou Plant Diagnostic Laboratory will reopen and include turfgrass submissions. I will serve as the faculty leader of the clinic and committee chair for operation oversight. The website/listserv

combination has a strong readership and is a valuable tool for reaching our clientele. I also serve as the coordinator of the Missouri Turf & Ornamental field day, which had very good attendance in 2013.

Extension Program

Faculty member: Brad Fresenburg

Brad Fresenburg is an Assistant Extension Professor of Turfgrass Sciences and serves as the State Turfgrass Specialist. This is a professional track position with 100% Extension responsibilities with some time dedicated to research and teaching.

Missouri Green Industry Conference:

The Missouri Green Industry Conference was held on December 6, 2012 at the St. Charles Convention Center. Tracks (Golf, Sports Turf, Lawn Care & Landscape, Ornamentals, Irrigation, Irrigation Workshop, Equipment Maintenance & Safety, and Pesticide Applicator Re-Certification) were offered in a single day with Pesticide Applicator Re-certification offered as an option on the same day. This joint conference included the Gateway Irrigation Association (GIA), the Gateway Chapter of STMA, the Missouri Turf & Ornamental Council (MoTOC), the Mississippi Valley Golf Course Superintendents Association (MVGCSA) and a new partner – the Missouri Landscape & Nursery Association (MLNA). Last year's attendance with speakers, vendors and participants was 480. Vendor booth spaces (40) were sold out in the first section of the exhibit hall forcing the opening of the second part for 61 total vendors.

The conference partners did establish themselves as a separate entity this year with the addition of the fifth partner - MLNA. This was done for ease of paying cost, liability and insurance. A five member Board of Directors was formed with annual rotating officer positions and by-laws written.

We are scheduled for December 5, 2013 for this year's conference at the St. Charles Convention Center. Information is available at motic.org. Brad is presently serving on the conference board as the Academic Advisor and conducts the Pesticide Applicator Re-certification Program.

University of Missouri Turfgrass & Ornamental Field Day:

Participated in the 2013 Field Day – presented "Why Has Lawn Care Gotten So difficult?"

Heartland Green Industry/Common Ground Expo:

The Heartland Green Industry/Common Ground Expo was held on December 17th and 18th, 2012 at the Overland Park Convention Center in Overland Park, KS. Tracks (Golf, Lawn Care, Business, and Pesticide Re-certification) were offered over 2 days. This was a joint conference with the Heart Golf Course Superintendents Association and Mid-America Green Industry Council. They are currently lining up tracks, topics, and speakers for 2013. This year's expo is scheduled for December 16th and 17th. Information will be posted at the magicouncil.org web site. Brad participates in the Pesticide Re-certification Program of the conference.

Commercial & Non-commercial Pesticide Applicator Training:

Pesticide Applicator Training was held in Springfield, Kansas City, Columbia, Cape Girardeau, and St. Louis, MO for four weeks in January. Total attendance was 2068.

Category 3 (Ornamental & Turf) attendance was 666 (32% of total). Of the 666, 131 of the participants were new applicators seeking certification training.

Dr. Lee Miller, Dr. Chris Starbuck and I did complete the revision of the training manual - Manual 89 Ornamental and Turf. It will be used for the 2014 Certification and Re-certification Training in January.

Master Gardener Training:

Conducted 17 Master Gardener training session for Home Lawn Care in various locations across Missouri. Total for new trainees was 345.

With the departure of our Master Gardener coordinator in 2010, Dr. David Trinklein has been filling in as the campus coordinator. Presently, the Master Gardeners are taking more ownership of the state-wide program hoping that the College will not need to provide a permanent campus coordinator and have state specialist conduct fewer training sessions, if any. Online training modules for each of the respective training sessions are complete and are about to go online. Six modules (108 slides) with voice-over recordings for Lawn Care have been completed. Trainees will need to complete a series of test questions with a passing score prior to moving onto the next topic. This will definitely save on time and travel for state specialist participating in this program.

Sports Turf AdvanTage (STAT) program:

STAT is a program designed to train sports turf managers about sports field maintenance, construction, and design. These are 1 day programs that offer 4 hours of classroom time on various topics from turfgrass maintenance to irrigation to pest management to infield mixes. The second half of the day is spent on a local facility for demonstrations, field evaluations, and recommendations. These programs are coordinated by regional extension specialist with state specialist providing some of the topics and discussion. This program fills a need to provide education opportunities to sports turf managers who cannot attend national and regional conferences. Minimal fees are charged to recover cost and provide a lunch. This year two programs were coordinated with the Parks and Rec Departments of Kansas City and Springfield, Missouri. Several monthly field days with the Gateway, Mo-Kan and Ozarks Chapters of STMA have had excellent attendance as well with an average attendance of around 35.

General turf program comments

The turf program at the University of Missouri has been steady growing. Our research and extension activities have improved our impacts in the state.

BRIEF State Report for NCER221

University: University of Nebraska Lincoln

Official NCERA rep: Zac Reicher

Email: zreicher2@unl.edu

Phone: 402-472-2834

Teaching Program

Current undergraduate enrollment: 40

Trend in undergraduate enrollment over last 3 years: steady to slightly increase

Placement: 100%

Brief comments on teaching: Can't find enough students to fill entry level jobs in the northern great plains.

Research

Research

Faculty member (complete for each faculty member): Zac Reicher

Current or recently graduated graduate student: Chris Proctor

MS or PhD: PhD

Project(s): Control and Biology of Purslane

Graduation date: Dec 2012

Current or recently graduated graduate student: Jesse Brown (co-advised with Keenan Amundsen)

MS or PhD: MS

Project(s): Population dynamics of *Poa annua* in response to herbicides and growth regulators

Graduation date: Dec 2013

Current or recently graduated graduate student: Luqi Li (co-advised with Keenan Amundsen)

MS or PhD: MS

Project(s): Improving establishment of buffalograss

Graduation date: May 2015

Current or recently graduated graduate student: Darrel J Michael (co-advised with Keenan Amundsen)

MS or PhD: MS

Project(s): Improving seed yield of buffalograss

Graduation date: Dec 2016

Other notable research projects led by faculty member:

Title: Controlling *Poa annua* on putting green height turf in Indiana, Michigan, and Nebraska

Description: Season-long application regimes for potentially controlling annual bluegrass at greens height.

Collaborators (name, institution): Aaron Patton, Purdue; Aaron Hathaway, Michigan State

Status: Finished and draft publication currently

Title: Systems approach to *Poa annua* control on putting greens

Description: 8 season-long systems for controlling annual bluegrass at greens height.

Collaborators (name, institution): Aaron Patton, Purdue; Bruce Branham, Univ of Illinois

Status: Starts in April 2014

Title: Summer interseeding and aggressive post-seeding herbicides to reduce annual bluegrass in fairways

Description: Systems approach to increasing desired turf in fairways without closing fairways

Collaborators (name, institution): Dave Minner, Iowa State

Title: Management of *Poa trivialis*

Description: Two experiments for either maintaining or controlling *Poa trivialis*.

Collaborators (name, institution): Jack Fry, Kansas State

Publications with NCERA 221 collaborators:

1. Proctor, C. A., M. Sousek., D. V. Weisenberger, A. J. Patton, and Z. J. Reicher. 2012. Combining preemergence herbicides in tank-mixtures or as sequential applications provides season-long crabgrass control. *HortScience*. 47(8):1159–1162.
2. Sousek, Matthew D., Roch E. Gaussoin, Aaron J. Patton, Daniel V. Weisenberger, and Zachary J. Reicher. 2013. Weed Control and Turf Safety of Single and Sequential Applications of Herbicides Over Spring Seedings. *Applied Turfgrass Science*. Accepted.

Faculty member (complete for each faculty member): Roch Gaussoin

Current or recently graduated graduate student: Scott Dworak

MS or PhD: PhD

Project(s): Deficit irrigation of 30 turfgrass species and cultivars in two diverse environments

Graduation date: May 2014

Current or recently graduated graduate student: Alex Kohel

MS or PhD: MS

Project(s): Signaling molecule effects on germination and establishment of seeded Kentucky bluegrass and zoysiagrass

Graduation date: May 2014

Current or recently graduated graduate student: Matt Pederson

MS or PhD: PhD

Project(s): Investigating the potential of select whole grass extracts and their isolated

components for protection against mammalian inflammation
Graduation date: May 2016

Other notable research projects led by faculty member:

1. Goss, R. M., and R. E. Gaussoin. 2013. Biostimulants and mycorrhizas do not increase *Poa pratensis* establishment on a sand-based root zone. *Int. Turfgrass Soc. Res. J.* 12:p. 169-177.
2. Wang, Y., W. Fang, D. Li, and R. Gaussoin. 2013. Soil chemical properties of golf greens affected by age, initial construction and establishment. *Int. Turfgrass Soc. Res. J.* 12:p. 539-544.
3. Stamm, M. D., T. M. Heng-Moss, F. P. Baxendale, B. D. Siegfried, R. E. Gaussoin, D. D. Snow, et al. 2013. Effect of distribution and concentration of topically applied neonicotinoid insecticides in buffalograss, *Buchloe dactyloides*, leaf tissues on the differential mortality of *Blissus occiduus* under field conditions. *Pest Management Science.* 69(2):p. 285-291.

Faculty member (complete for each faculty member): Keenan Amundsen

Current or recently graduated graduate student: Jesse Brown (co-advised with Zac Reicher)

MS or PhD: MS

Project(s): Population dynamics of *Poa annua* in response to herbicides and growth regulators

Graduation date: Dec 2013

Current or recently graduated graduate student: Luqi Li (co-advised with Zac Reicher)

MS or PhD: MS

Project(s): Improving establishment of buffalograss

Graduation date: May 2015

Current or recently graduated graduate student: Darrel J Michael (co-advised with Zac Reicher)

MS or PhD: MS

Project(s): Improving seed yield of buffalograss

Graduation date: Dec 2016

Other notable research projects led by faculty member:

1. Honig, J.A., C. Kubik, M. Majewski, C. Poulsen, E. Weibel, K. Amundsen, S.E. Warnke, W.A. Meyer, S.A. Bonos. 2013. A PCR-based linkage map of *Agrostis stolonifera* and identification of QTL markers for dollar spot resistance. *Mol. Gen. Genet.* (accepted)
2. Ramm, C., A. Saathoff, T. Donze, T. Heng-Moss, F. Baxendale, P. Twigg, L. Baird, K. Amundsen. 2013. Expression Profiling of Four Defense-Related Buffalograss

- Transcripts in Response to Chinch Bug (Hemiptera: Blissidae) Feeding. *J. Economic Entomology* (accepted)
3. Bimal Amaradasa , Brandon Horvath , Keenan Amundsen, Dilip Lakshman. 2013. Development of SCAR markers and UP-PCR cross-hybridization method for specific detection of four major subgroups of *Rhizoctonia* from infected turfgrasses. *Mycologia* (accepted)
 4. Ramm, C., A. Saathoff, T. Donze, T. Heng-Moss, F. Baxendale, P. Twigg, L. Baird, K. Amundsen. 2013. Expression Profiling of Four Defense-Related Buffalograss Transcripts in Response to Chinch Bug (Hemiptera: Blissidae) Feeding. *J. Economic Entomology* (accepted)
 5. Bimal Amaradasa , Hugo Madrid Lorca , Johannes Groenewald , Pedro Crous, Keenan Amundsen. 2013. *Porocercospora seminalis* gen. et comb. nov., the causal organism of buffalograss false smut. *Mycologia* (accepted)
 6. Amaradasa, B.S., K. Amundsen. 2013. First Report of *Curvularia inaequalis* and *Bipolaris spicifera* Causing Leaf Blight of Buffalograss in Nebraska. *Plant Disease*. In press
 7. Wachholtz, M., T. Heng-Moss, P. Twigg, L. Baird, G. Lu, K. Amundsen. 2013. Transcriptome analysis of two buffalograss cultivars. *BMC Genomics* 14:613.
 8. Peterson, K. W., Wegner, C. J., Amundsen, K., Gaussoin, R. E., Schacht, W., Horst, G., Shearman, R. (2013). Mowing Height and Genotype Influence on Carbohydrate Content of Buffalograss. *Crop Science*,53(3):1153-1160.

Publications with NCERA 221 collaborators:

1. Bushman, B.S., Warnke, S.E., Amundsen, K.L., Combs, K.M., Johnson P. (2013). Molecular markers highlight variation within and among Kentucky bluegrass varieties and accessions. *Crop Science*. 53(5):2245-2254.

Faculty member: Tiffany Heng-Moss and Fred Baxendale

Current or recently graduated graduate student: Crystal Ramm

MS or PhD: Ph.D.

Project(s): Molecular insights into the defense response of buffalograss to chinch bugs

Graduation date: May 2014

Current or recently graduated graduate student: Kyle Koch (co-advised with Jeff Bradshq)

MS or PhD: M.S.

Project(s): Evaluation of tetraploid switchgrasses for resistance to phloem-feeding insects

Graduation date: August 2013

Current or recently graduated graduate student: Travis Prochaska (co-advised with Gautam Sarath)

MS or PhD: Ph.D.

Project(s): Physiological, biochemical and anatomical insights into aphid-switchgrass interactions

Graduation date: May 2015

1. Ramm, C. A. Saathoff, T. Donze, T. Heng-Moss, F. Baxendale, P. Twigg, L. Baird and K. Amundsen. 2013. Expression Profiling of Four Defense-Related Buffalograss Transcripts in Response to Chinch Bug (Hemiptera: Blissidae) Feeding. *J. Econ. Entomol.* (In press).
2. Koch, K., Fithian, R., T. Heng-Moss, J. Bradshaw, G. Sarath, and C. Spikler. 2013. Evaluation of tetraploid switchgrass populations (*Panicum virgatum* L.) for host suitability and differential resistance to four cereal aphids. *J. Econ. Entomol.* (Accepted).

Other notable research projects led by faculty member:

1. Wachholtz, M., T. Heng-Moss, P. Twigg, L. Baird, G. Lu, K. Amundsen. 2013. Transcriptome analysis of two buffalograss cultivars. *BMC Genomics* 14:613.
2. Aaron J. Saathoff, Teresa Donze, Nathan, A. Palmer, Jeff Bradshaw, Tiffany Heng-Moss, Paul Twigg, Christian M. Tobias, Mark Lagrimini and Gautam Sarath. 2013. Towards uncovering the roles of switchgrass peroxidases in plant processes. *Frontiers in Plant Science* (In Press).

Extension

State conference dates: January 8-10rd

Collaborating with other organizations on conference (yes/no): No

If so who:

Attendance figure: 700

Research field day held (yes/no): Yes

If so, when: July 24

Attendance figure: 200

Other Extension activities: Backyard Farmer TV, Thursday nights ~20,000 viewers/episode

Web (yes/no): Yes

FaceBook/Twitter/social networking (yes/no): Yes

Joint Extension activities/publications with other regional collaborators over in the last two years:

Staffing:

Additions: Bill Kreuser will join the faculty in January of 2014 as Turfgrass Extension Specialist

Retirements/vacancies: None

BRIEF State Report for NCER221

University: North Dakota State University

Official NCERA rep: Deying Li

Email: deying.li@ndsu.edu

Phone: (701)231-8037

Teaching Program

Current undergraduate enrollment: 15

Trend in undergraduate enrollment over last 3 years: decrease

Placement: 95%

Brief comments on teaching: Most students have low ACT/SAT.

Research

Faculty member (complete for each faculty member): Deying Li

Current or recently graduated graduate student: 2

MS or PhD: MS.

Project(s): Turf Quality of Creeping Bentgrass Using Foliar Fertilization Tank-mixed with Sprayable Organic Amendments

Graduation date: July 2013

MS or PhD: PhD.

Project(s): Phytoremediation of Soils Contaminated by Oil and Gas Drilling and Production Operations Using Grass Species.

Graduation date: Dec. 2014

NCERA collaborators on grad projects

(Copy and paste as needed)

Other notable research projects led by faculty member: Deying Li

Title: Stress tolerance of turfgrass and bioremediation using grass species on hydrocarbon contaminated soils.

Other notable research projects led by faculty member: Qi Zhang

Title: Evaluation of salinity tolerance and its related issues in turfgrass

Other notable research projects led by faculty member: Alan Zuk

Title: Evaluation of ornamental grasses. Herbicides evaluation.

Description:

NCERA Collaborators (name, institution):

Steven Keeley, Kansas State University; Nick Christians, Iowa State University; Roch Gaussoin, University of Nebraska, Lincoln.

Publications with other NCERA collaborators over the last two years:

Wang, Y., W.Fang, D. Li, and R. Gaussoin. 2013. Soil chemical properties of golf greens affected by age initial construction and establishment. Intern. Turfgrass Soc. Res. J. 12:539-544.

Klingenberg, M.T., D.Li, N.E. Christians, and C.J. Blume. 2013. Core aeration programs and sand topdressing improve creeping bentgrass fairways. Intern. Turfgrass Soc. Res. J. 12:151-156.
Han, L., D. Li, W. Fang, Y. Wang, and R. Gaussoin. 2012. Analysis of soil chemical properties of sand-based turfgrass rootzone using Fourier transform infrared spectroscopy. Communications in Soil Science and Plant Analysis. 43:2709-2721. DOI: 10.1080/00103624.2012.719981

Extension Program

State conference dates: No

Collaborating with other organizations on conference (yes/no): no

If so who:

Attendance figure:

Research field day held (yes/no):No

If so, when:

Attendance figure:

Other Extension activities: all our faculty answer phones and email questions from local and regional stake holders.

Web (yes/no): <http://www.ag.ndsu.edu/plantsciences/>

FaceBook/Twitter/social networking (yes/no):

<https://www.facebook.com/NDSUPlantSciences>

Brief comments on Extension: No local industry support.

Staffing: 1

Additions: 0

Responsibilities: work with Qi Zhang and maintain research station

Retirements/vacancies: Ron Smith retired as of December 2012.

General turf program comments: Possible elimination or combination with Horticulture program.

BRIEF State Report for NCERA221

University: The Ohio State University

Official NCERA rep: None but will be David Gardner

Email: gardner.254@osu.edu

Phone: 614-292-9002

Teaching Program

Current undergraduate enrollment: 32

Trend in undergraduate enrollment over last 3 years: Down 20

Placement: 100%

Brief comments on teaching: All classes continue to be offered but with lower enrollments. PGM students (65 majors currently) also take some turf courses. Pam Sherratt and Dave Gardner have assumed more responsibilities in general education and landscape horticulture.

Research

Faculty member: Dave Gardner

Current or recently graduated graduate student: Arly Drake

MS or PhD: M.S.

Project(s): Influence of Cultural Practices on Sand-Based Putting Green Firmness

Graduation date: 2013

Current or recently graduated graduate student: Dominic Petrella

MS or PhD: Ph.D.

Project(s): Methods of Inducing Anthocyanin Production in Plants

Graduation date: 2016

Current or recently graduated graduate student: John Koenig

MS or PhD: Ph.D.

Project(s): New herbicides for weed control in cool season turfgrass

Graduation date: 2015

Other notable research projects led by faculty member:

Integrating Microclover with Turfgrass to Develop a More Environmentally Sustainable Ecosystem

Faculty member: Karl Danneberger

Current or recently graduated graduate student: Aneta Studzinska

MS or PhD: Ph.D.

Project(s): The effect of *PcGA2-oxidase* Overexpression on growth and development of Creeping Bentgrass (*Agrostis stolonifera* L.) in Full Sun and Reduced Light.

Graduation date: Spring, 2011

Faculty member: John Street

Current or recently graduated graduate student: Eva Fang
MS or PhD: MS
Project(s):Methiozolin control of Poa annua
Graduation date: 2015

Other notable research projects led by faculty member:

Title: The effects of foliar and granular nitrogen fertilization at various rates and frequencies on creeping bentgrass quality and dollar spot incidence

Title: The new cold tolerant bermudagrasses are being evaluated as a species option for sports turf fields in the midwest

Title: The effects of various compost types and rates with and without core cultivation are being evaluated for turfgrass quality and playability on sports turf under traffic

Title: Postemergence crabgrass control research is being conducted with various herbicides, herbicide combinations, herbicide rates and surfactants to improve the consistency in crabgrass control at various crabgrass maturity stages and provide for effective crabgrass control in a single application

Publications with other NCERA collaborators over the last two years:

Gardner, D.S., B.P. Horgan and B.J. Horvath. 2013. Spatial Variability of Soil Amino Sugar Nitrogen on Golf Course Fairways. Int. Turf. Soc. Res. J. 12:

Extension Program

State conference dates: Dec 4-6

Collaborating with other organizations on conference (yes/no): no

If so who:

Attendance figure: 2800

Research field day held (yes/no): Yes

If so, when: Aug 7, 8

Attendance figure: 200+200

Other Extension activities: Golf and Sports turf Short Course

Web (yes/no): yes

FaceBook/Twitter/social networking (yes/no): yes

Brief comments on Extension

Staffing:

Additions: None

Responsibilities:

Retirements/vacancies: None

General turf program comments

BRIEF State Report for NCERA221

University: Purdue University

Official NCERA rep: Aaron Patton/Cale Bigelow

Email: ajpatton@purdue.edu

Phone: (765) 494-9737

Teaching Program

Current undergraduate enrollment: 40

Trend in undergraduate enrollment over last 3 years: Decrease in undergraduate population about 15%

Placement: All 2012-2013 graduates have been placed.

Brief comments on teaching:

- Purdue adopted a University-wide core curriculum and all degree programs to 120 credit hours as mandated by a new state law effective Fall 2013. This was a decrease from 132 credit hours in the previous plans of study.

Research

FACULTY MEMBERS:

1. Cale Bigelow, Department of Agronomy
2. Yiwei Jiang, Department of Agronomy
3. Aaron Patton, Department of Agronomy
4. Rick Latin, Department of Botany and Plant Pathology
5. Doug Richmond, Department of Entomology

Other notable research projects led by group:

A number of experiments continued in 2012/2013 to address practical problems and environmental concerns related to the turfgrass industry. Studies continued to focus on improved understanding of proper cultivar selection, fertility and irrigation programs, plant stress physiology, weed control, pest biology, and disease resistance to minimize management inputs required to achieve management goals and protect the environment.

- 1) The fourth year of a field study assessing soil phosphorus (P) accumulation in response to the application of various synthetic and natural organic lawn fertilizer products.
- 2) A collaborative study between Purdue University, Mendel University (Czech Republic) and Penn State University was completed to evaluate the feasibility, persistence and performance of various novel lawn species and micro-clover species. This preliminary study was designed to investigate the potential use of micro-clovers as a method to reduce lawn fertilizer needs.
- 3) Crabgrass control can be increased through proper timing of nitrogen fertilization prior to herbicide application without increasing the amount of herbicide used.

- 4) Initiated research on the use of micronutrient applications to control troublesome weeds, thus reducing the amount of herbicide needed to be used for acceptable control.
- 5) Initiated research on the influence of hard water on herbicide efficacy with preliminary research discovering economical methods to enhance the efficacy of currently used postemergence herbicides.
- 6) Identified tall fescue and Kentucky bluegrass cultivars requiring less annual mowings and thus fewer fossil fuels to maintain.
- 7) In 2011 a regional N study was initiated at 11 field sites throughout the cool-humid and transition zone regions. The goal of this study was to evaluate the effect of autumn N application timings on turfgrass color response and soil N status.
- 8) Allelic variations in *LpLEA3* gene affect whole-plant response to drought and salinity stress and winter survival of perennial ryegrass population.
- 9) Preliminary results indicate that fungicide inputs on less susceptible cultivars may be reduced to less than 20% of that used for more susceptible cultivars.
- 10) Bioassay results for fungicides used for disease control indicate that residual efficacy is reduced to levels approaching 10% control within 7-10 days after application. Results from the bioassay were reinforced by quantitative analysis of fungicide residues in the verdure.
- 11) We have been exploring the efficacy of experimental microsclerotial formulations of the entomopathogenic fungus *Metarhizium anisopliae*, a potential biological control for Japanese beetle larvae. In the first of several planned trials, one of the two experimental formulations outperformed the commercial product by providing 50% control of Japanese beetle larvae under field conditions.
- 12) An ongoing multi-year field study has been evaluating various commonly planted and alternative golf turf fairway species for their performance and persistence under two mowing heights (1/2" and 3/4") when maintained without supplemental irrigation. To date the feasibility of utilizing fescues and some Kentucky bluegrasses appear promising for seasonally consistent green, dense fairway turf.

Joint refereed publications with other regional collaborators:

1. Sousek, M.D., R.E. Gaussoin, A.J. Patton, D.V. Weisenberger, and Z.J. Reicher. 2013. Weed control and turf safety of single and sequential applications of herbicides over spring seedings. *Appl. Turfgrass Sci. In press.*
2. McMillan, M.F., S. Kostka, T. Boerth, C.A. Bigelow, J.Cisar, D. Soldat, A. Van Dyke, I. Karas, and K. Williams. 2013. Monitoring seasonal soil water repellancy in USA golf course putting greens. *Intl. Turf Soc. Res. J.* 12:815-818.

Combined listing of refereed publications from faculty

1. Beck, L.L., A.J. Patton*, and D.V. Weisenberger. 2014. Mowing before or after an herbicide application does not influence ground ivy (*Glechoma hederacea*) control. Appl. Turfgrass Sci. *In press*.
2. Brosnan, J.T., G.K. Breeden, A.J. Patton, and D.V. Weisenberger. 2013. Triclopyr reduces smooth crabgrass bleaching with topramezone. Appl. Turfgrass Sci. doi:10.1094/ATS-2013-0038-BR.
3. Elmore, M.T., J.T. Brosnan, G.K. Breeden, and A.J. Patton. 2013. Mesotrione, topramezone and amicarbazone combinations for postemergence annual bluegrass (*Poa annua*) control. Weed Technol. 27:596-603.
4. Hctor, T.L., T.J. Gibb, C.A. Bigelow and **D.S. Richmond**. 2013. Survival and infectivity of the insect-parasitic nematode *Heterorhabditis bacteriophora* Poiinar in solutions containing four different turfgrass soil surfactants. *Insects 4: 1-8*. doi:10.3390/insects4010001.
5. Patton, A.J., D.V. Weisenberger, J.T. Brosnan, and G.K. Breeden. 2013. Safety of labeled herbicides for broadleaf weed control in creeping bentgrass putting greens. Turfgrass Sci. doi:10.1094/ATS-2013-0523-01-BR.
6. Patton, A.J., G.E. Ruhl, T.C. Creswell, P. Wan, D. Scott, J. Becovitz, and D.V. Weisenberger. 2013. Potential damage to sensitive landscape plants from wood chips of aminocyclopyrachlor damaged trees. Weed Technol. *In press*.
7. Sousek, M.D., R.E. Gaussoin, A.J. Patton, D.V. Weisenberger, and Z.J. Reicher. 2013. Weed control and turf safety of single and sequential applications of herbicides over spring seedings. Appl. Turfgrass Sci. *In press*.
8. Tang, J., J. Camberato, X. Yu, N. Luo, and Y. Jiang*. 2013. Growth response, carbohydrate and ion accumulation of diverse perennial ryegrass accessions to increasing salinity. Sci. Hortic. 154: 73–81.
9. Tang, J., X. Yu, N. Luo, F. Xiao, J.J. Camberato, and Y. Jiang*. 2013. Natural variation of salinity response, population structure and candidate genes associated with salinity tolerance in perennial ryegrass accessions. Plant Cell Environ. 36:2021-2033.
10. Wang, K., and Y. Jiang*. 2013. The effects of short-term excessive irrigation on growth and physiology of creeping bentgrass on sand and soil greens. Intl. Turf Soc. Res. J. 12: 517-522.
11. Yu, X., G. Bai, S. Liu, N. Luo, Y. Wang, **D.S. Richmond**, P.M. Pijut, S. Jackson, J. Yu and Y. Jiang. 2013. Association of candidate genes with drought tolerance traits in diverse perennial ryegrass accessions. *Journal of Experimental Botany* doi:10.1093/jxb/ert018.
12. Yu, X., G. Bai, S. Liu, N. Luo, Y. Wang, D.S. Richmond, P.M. Pijut, S.A. Jackson, J. Yu, and Y. Jiang*. 2013. Association of candidate genes with drought tolerance traits in diverse perennial ryegrass accessions. J. Exp. Bot. 64: 1537–1551.
13. McMillan, M.F., S. Kostka, T. Boerth, C.A. Bigelow, J.Cisar, D. Soldat, A. Van Dyke, I. Karas, and K. Williams. 2013. Monitoring seasonal soil water repellancy in USA golf course putting greens. Intl. Turf Soc. Res. J. 12:815-818.

14. Bigelow, C.A., and W. Tudor Jr. (2013-Accepted) Flurprimidol application timing affects annual bluegrass suppression in a mixed annual bluegrass and creeping bentgrass fairway. Hort. Technology
15. Bigelow, C.A. J.R. Nemitz, and A.C. Moeller. (2013-Accepted). Repair tool and nitrogen regime effects on golf ball pitch mark healing. Hort Technology.

Extension Program

State conference dates: Indiana Green Expo, January 9-11, 2012

*Collaborating with other organizations on conference (yes/no):*Yes

If so who: Indiana Professional Landscape Association

Attendance figure: 1,975

Research field day held (yes/no): yes

If so, when: July 9, 2013

Attendance figure: 525 in 2013

Other Extension activities:

- Sports Turf Management Training, June 10, 2013
- Lawn Care Diagnostic Training, August 1, 2013
- Turf and Ornamental Seminar, November 13-14, 2013
- Turf Herbicide Workshop, December 3, 5, 10, 12, 2013 (same workshop at four locations)

Web (yes/no): <http://www.agry.purdue.edu/turf>

Facebook/Twitter/social networking (yes/no): Twitter: @BoilermakerTurf Facebook: Purdue Turf

Blog: <http://purdueturftips.blogspot.com/>

Brief comments on Extension: see below under general comments.

Staffing:

Additions: none.

Retirements/vacancies: Dr. Tim Gibb is reducing his turf entomology extension appointment and Dr. Doug Richmond has added turf entomology extension efforts to his appointment.

General turf program comments

The turf program at Purdue remains stable. Enrollment in the 4-yr Bachelor's degree program has dropped to approximately 40 students. Graduation placement remains 100%. Based on new state legislation, all Purdue degree options where a specific number of credit hours is not needed professional accreditation dropped down to 120 hours as the state mandated minimum number of credit hours needed for a bachelor's degree. The Purdue turf science and management degree option required 132 credits previously and now requires only 120 due to this change.

The program's research efforts continue to be productive and a variety of projects are in progress related to management of both warm and cool-season turfgrasses. Attendance for the Turf program's large outreach events such as the Indiana Green Expo (historically

> 1,200 turf of 1,900 total attendees) and summer Turf Field Day (historically > 550) are stable. Research support is also declining but efforts to increase our endowment investments have increased in 2013 into 2014. Seasonal Turf Tips continues to be delivered electronically to over 2,800 individuals. Dr. Aaron Patton was promoted to Associate Professor with tenure effective 15 Aug. 2013. Cale Bigelow and Aaron Patton each won awards from the college this year due to their teaching and extension efforts, respectively.

BRIEF State Report for NCER221

University: Southern Illinois University

Official NCERA rep: Kenneth L. Diesburg

Email: diesburg@siu.edu

Phone: 618-453-1787

Teaching Program

Current undergraduate enrollment: 21

Trend in undergraduate enrollment over last 3 years: Up

Placement: 100%

Brief comments on teaching: The SIU undergraduate turf program continues to attract the bulk of turf students in the state. Since 1989 we have graduated 272 students from the Turf Program, with a 100% placement rate. Internships are critical to the placement. There were 28 turf students in our 2011/2012 program.

Our SIU Chapter of the GCSAA (our turf club) is very active. It has annual golf fund-raisers in working toward financing the trip of four-person teams to attend the Golf Industry Show (GIS) and compete in its Turf Bowl. In 2009, an arrangement was made with the superintendent and owner of a local golf course to release the golf course to the turf club for one day without charge in return for assistance they provide in preparation for golf tournaments. This year the club netted over \$2000 which was used to pay for sending two teams to the GIS in Las Vegas.

Research

FACULTY MEMBER: KEN DIESBERG

Tall Fescue Breeding: I am still looking at the potential advantage of practicing S_1 selection in tall fescue compared to the typical practice of recurrent selection. If I had a graduate student interested in this area, as was Keith Rincker, we would proceed to develop tall fescue varieties uniquely adapted to the environmental conditions of Illinois.

Zoysia Breeding After 15 years of plant selection, matings, turf evaluations, I have 22 polycrosses from which several cultivars might be developed. Presently, I am accumulating enough seed from them to establish turf plots for evaluation of the hybrids. My goal is to develop the first seeded zoysia cultivar that is comparable to the clone, >Meyer=, in texture and winter hardiness. Along the way I will also be incorporating selection for greater seedling vigor and resistance to *Rhizoctonia*. I especially need funding to enable this screening process.

Zoysia Zonal Adaptation For several years I have been testing zoysia for establishment in the Chicago area. The goal is to determine establishment and management protocol to favor persistence of zoysia. The plantings at the Sunshine Golf Course, Chicago District Golf Association Golf House, have shown that bare ground is needed for enough soil heat accumulation to support rapid establishment of zoysia. Interplanting it with cool-season grass is a very slow and risky process. The larger zoysias have much greater probability of persistence against cool-season grasses. Lower clipping heights (2 to 12 inch) favor zoysia.

Timing of Seeding Zoysia One of the greatest barriers in eventual adoption of seeding zoysia is the combination of its weak seedling vigor and the recommendation for summer seeding, since it is a warm-season grass. Experiments since 2008 in Southern Illinois have shown that winter dormant seedings and spring seedings of the warm season grasses, zoysia and bermuda, provide for better establishment than that from summer seedings when using low-input establishment procedures. May seedings of zoysia did not do as well, while June, July, and August seedings fail completely.

Determination of Nitrogen Recommendation Based on Soil Type I am participating in this new study, installed this past fall in several states, being directed by Dr. Cale Bigelow, Purdue University

NTEP Cultivar Trials: The **2006 tall fescue** shade trial did very well and ended this fall. It provided good separation of cultivars for shade tolerance of rather intense shade at $92 \pm 51 \mu\text{moles}/\text{m}^2\text{sec}$, which is about one fourth the minimum level of irradiance for maximum photosynthesis of cool-season grasses. Approximately 2/3 of the 113 entries maintained over 60% cover with Justice, Millennium, Hudson, Corona, Aristotle, Jamboree, Turbo RZ, Essential, Pedigree, Rebel IV, Hunter, Titanium LS, AST9003, SR8650, Shenandoah III, Falcon IV, and Mustang 4 at the top of the rankings.

The **2003 fine fescue** shade trial that ended in 2007 identified hard fescue cultivars as the only species that performs well through the heat and drought of Southern Illinois. The 2008 fine fescue trial, at $108 \pm 63 \mu\text{moles}/\text{m}^2\text{sec}$, is in the same site. With all the rain in 2009 there was little cultivar separation. But that has changed with the extreme heat and short droughts of 2010 and 2011. The top ranking cultivars are presently Z6300 (hard), Gotham (hard), PSG 50C3 (chewings), PST 4BU3 (blue hard), and MVS-FRC-101 (chewings).

The **2008 Bentgrass Shade Trial** under tee management was is under $111 \pm 28 \mu\text{moles}/\text{m}^2\text{sec}$ irradiance with cultivars subsequently separating in their tolerance to the shade. The top ranking entries were Authority, CY-2, A08-FT12, and MVS-Ap-101 in terms of shoot density and percent cover. I fear, however that the trial might be lost. I applied a light rate of Turflon to get rid of a growing, woody, broadleaf weed problem, and it damaged the bentgrass severely.

SIU Carbondale was chosen as the national site for the only shade trial for each of the **2011 Kentucky Bluegrass** and the **2012 Tall Fescue Cultivar Trial**. The Kentucky bluegrass cultivars were seeded last fall. The tall fescue cultivars will be seeded this fall.

Substituting Glufosinate for Glyphosate in Application to Winter Dormant Zoysia.

Glufosinate (Finale) has been available for at least the past fifteen years for the same applications as glyphosate. The practical differences between the two products have been two-fold: Glyphosate kills more completely by being translocated more extensively throughout the plant, and for the same reason, the edge of glufosinate kill is more distinct and precise. Glyphosate (Roundup) has long been a useful tool for spraying on dormant zoysia during February or Early March in eliminating perennial and winter annual weeds. There is the question, therefore, of the relative efficacy of these two products for this use. Results show that the 6-qt rate of glufosinate is as effective as the standard 16-oz glyphosate rate. The new turf professor at the University of Missouri, Xi Xiong, conducted the same trial with identical results. We presented a poster of our combined results at the American Society of Agronomy meetings in San Antonio last October.

Efficacy of >Celcius= and >Imprelis= and Turf Quality in Postemergent Control of Broadleaf Weeds in Kentucky Bluegrass.

In the world of postemergent broadleaf weed control, various combinations of >3-way= compounds have been used for at least the past 25 years. A new one, >Celcius= from Bayer, contains dicamba, thienencarbazone-methyl, and iodosulfuron. Dupont has a new compound aminocyclopyrachlor, >Imprelis=, that could possibly have similar efficacy without being a 3-way. It has additional features in being odorless, nonvolatile, and needing a low application rate. In this single year of study the preliminary data indicate the 2S and RTU (Ready-to-use) formulations of Imprelis to be completely effective as was Trimec (the check). The granular formulation was not quite as effective due to less uniform application of the compound. Celcius was also completely effective. Kentucky bluegrass turf quality was enhanced with the granular formulation of Imprelis due to the inclusion of a fertilizer in the product. Celcius was the only treatment to lower turf quality.

Testing >Imprelis= for long-term preemergent activity against crab grass.

In 2010 some university researchers, including me, detected late summer absence of crabgrass in the Imprelis plots where we had tested for postemergent broadleaf control. This year, an experiment was installed with the objective of determining whether crabgrass control, if any, was happening from pre- or post-activity. Three applications of Imprelis; 0, 7, and 14 days after seeding tall fescue were imposed as if Imprelis is a preemergent, and we would detect any short- or long-term preemergent control of crabgrass, as well as any postemergent control of crabgrass seedling that might have already emerged on the day of seeding. Crabgrass pressure was high this year due to consistent rains through the summer. While there was some early post- and preemergent activity, control was not complete. And, by August, there were no differences in crabgrass presence among the treatments; thus no noticeable long-term control.

Testing tolerance of bermuda cultivars to >Specticle= preemergent.

In 2010 some university researchers noticed mild reduction in Bermudas turf quality that had been treated with Specticle. The SIU turf research program was chosen to screen eight representative Bermudas for tolerance. No significant or consistent damage was detected even though slight and temporary reductions on turf quality could be detected sporatically.

BRIEF State Report for NCER221

University: Wisconsin

Official NCERA rep: Doug Soldat

Email: djsoldat@wisc.edu

Phone: 608-263-3631

Teaching Program

Current undergraduate enrollment: 12

Trend in undergraduate enrollment over last 3 years: steady

Placement: 100%

Brief comments on teaching: Trading online courses with Univ of MN, working well and will be expanding offerings in the future, open to other collaborations with other schools.

Research

Faculty member (complete for each faculty member): Soldat

Current or recently graduated graduate student: Brad DeBels

MS or PhD: Ph.D.

Project(s): Developing a rapid and accurate method to measure ET from turf at the plot scale

Graduation date: Dec 13

Faculty member (complete for each faculty member): Soldat

Current or recently graduated graduate student: Glen Obear

MS or PhD: Ph.D. MS

Project(s): Soil physicochemical problems of sand root zones

Graduation date: Dec 13

Faculty member (complete for each faculty member): Williamson

Current or recently graduated graduate student: Glen Obear

MS or PhD: MS

Project(s): Non-target effects of fungicides on white grubs

Graduation date: Dec 13

Faculty member (complete for each faculty member): Soldat

Current or recently graduated graduate student: Sabrina Ruis

MS or PhD: Ph.D.

Project(s): Using DayCent and soil property info to improve nitrogen fertilizer recommendations for turf

Graduation date: Dec 15

Faculty member (complete for each faculty member): Kerns

Current or recently graduated graduate student: Renee Rioux

MS or PhD: Ph.D.

Project(s): Dollar spot biology, epidemiology, and host-pathogen interactions

Graduation date: Dec 13

Faculty member (complete for each faculty member): Stier
Current or recently graduated graduate student: Mark Garrison
MS or PhD: Ph.D.
Project(s): Carbon costs of lawn maintenance strategies
Graduation date: Dec 13

Publications with other NCERA collaborators over the last two years:

Extension Program

State conference dates: Jan 14, 2014

Collaborating with other organizations on conference (yes/no): No

Attendance figure: 150

Research field day held (yes/no): Yes

If so, when: The last Tuesday in July every year

Attendance figure: 250-300

Other Extension activities:

Web (yes/no): www.turf.wisc.edu

FaceBook/Twitter/social networking (yes/no): @djsoldat

Staffing:

Additions: In the process of hiring extension pathologist: 70% extension, 20% teaching, 10% research

Additions: Bruce Schweiger as Turf Diagnostic Lab Manager

Retirements/vacancies: Vacancies in Hort (expected to be a long term vacancy), and Plant Pathology (but not for long)

State Report for NCER221

University: Utah State University

Official NCERA rep: Paul G. Johnson/Kelly Koop

Email: paul.johnson@usu.edu

Phone: 435-797-7039

Teaching Program

Current undergraduate enrollment: Unsure since we don't have a dedicated turf major. I estimate it at 20 interested in turfgrass related careers.

Trend in undergraduate enrollment over last 3 years: stable to up

Placement: Very good.

Brief comments on teaching:

We do not have a dedicated turf program at Utah State University. Instead, students pursuing a career in turfgrass management are part of the Ornamental Horticulture or Landscape Design and Construction majors and as part of the off-campus Horticulture program which is designed to meet the needs of students along the Wasatch Front (Ogden, Salt Lake City, Provo). We have two courses in turfgrass science taught both on campus and off-campus. In 2012, we sent a team of students to the GCSAA Turf Bowl for the first time.

Research

Faculty member: Paul G. Johnson

Recently graduated graduate student: Nisa Leksungnoen

PhD

Project: The relationship between salinity and drought tolerance in turfgrasses and woody species.

Graduation date: May 2012

Current graduate student: Yingmei Ma

MS

Project: Genetic characterization of fine-leaved *Festuca valesiaca* (Schleicher ex Gaudin) accessions and evaluation of their relationship to the *F. ovina* complex.

Expected graduation date: August 2012

Current graduate student: Lijun Wang

MS

Project: Physiological changes and gene expression of Kentucky bluegrass during salt stress.

Expected graduation date: December 2012

Other notable research projects led by faculty member:

Title: Development of salt and drought tolerant Kentucky bluegrass germplasm

Description: A breeding program focused on evaluating, selecting, and improving Kentucky bluegrass materials for use in the western US with special emphasis on salt and

drought tolerance.

Collaborators (name, institution): Shaun Bushman and Joe Robins, USDA-ARS Forage & Range Research Lab

Brief comments on research:

This is an on-going program of collaboration with the USDA-FRRL to develop Kentucky bluegrass materials better suited to conditions and needs of turfgrass areas in the Western US. Soil conditions, climatic conditions, disease pressures, and insect pressures, among others are unique characteristics and many current varieties developed in the eastern US do not perform well. We have selected significantly more salt tolerant materials and better performing lines in drought and am currently evaluating for turf traits, seed production, and ability to combine with other germplasm. It also involves more basic genetic work on Poa and a side project studying turfgrass quality traits of other salt-tolerant species like Puccinellia. This project is funded by the USGA, Utah Agricultural Experiment Station, The Center For Water Efficient Landscaping, USDA-ARS Forage & Range Lab, and the Drought Management, Utah project.

Title: Nematodes and water conservation practices as alternatives to insecticides for billbug control in Intermountain West turfgrass.

Description: We are conducting work to understand billbug biology and phenology in the Intermountain West and determine the most successful management strategies to augment and establish populations of entomopathogenic nematodes in turfgrass.

Extension activities include working with cooperators in sod production, residential landscapes, and golf course management and presenting our findings at conventions tailored to each management type

Collaborators: Ricardo Ramirez, Kelly Kopp, and Paul Johnson at Utah State University and Ed Bechinski at the University of Idaho.

Faculty member (complete for each faculty member): Kopp

Current or recently graduated graduate student: Hongyan Sun

MS or PhD: PhD

Project(s): Characterizing water and nitrogen dynamics in urban landscapes/modeling

Graduation date: December 2011

Faculty member (complete for each faculty member): Kopp

Current or recently graduated graduate student: Paul Urzagaste

MS or PhD: MS

Project(s): Evaluation of climate-based irrigation controllers

Graduation date: December 2012 (projected)

Extension Program

State conference dates: None

Collaborating with other organizations on conference (yes/no): None

If so who:

Attendance figure: na

Research field day held (yes/no): Yes—in conjunction with a golf course superintendents meeting

If so, when: August 2011

Attendance figure: 60

Other Extension activities:

Web (yes/no): yes

FaceBook/Twitter/social networking (yes/no): no

Brief comments on Extension

Extension efforts include traditional speaking engagements, radio appearances and production of relevant and timely fact sheets and bulletins. A Turfgrass IPM Advisory is published quarterly and delivered to a listserv of 3375 individuals, organizations, and companies. The advisory provides opportunities for collaboration with members of the USU IPM group to include timely and correct information related to pest issues in the state.

A water check/irrigation auditing program has been in place in the state since 1999 and continues with the support of several water agencies in the state including the Central Utah Water Conservancy District, the Metropolitan Water District of Salt Lake City and Sandy, and the Jordan Valley Water Conservancy District. To date, more than 10,000 residential and 2000 commercial/industrial/institutional audits have been performed.

Major efforts continue on the eXtension Community of Practice (CoP) “Water Conservation for the Lawn and Landscape”. This effort has included the development of a national network of content experts and will result in an online resource that is both nationally, and increasingly internationally, significant.

Collaboration with the Irrigation Association’s SWAT (Smart Water Application Technologies) program continues with the development of a sprinkler nozzle testing protocol. The protocol, once vetted through the public comment process, will allow sprinkler nozzle manufacturers to opt in to objective, third party testing of their products. The program promotes landscape water use efficiency through the application of state-of-the-art irrigation technologies.

Staffing:

Additions: None

Responsibilities:

Retirements/vacancies: None

General turf program comments:

The Utah State University turfgrass program is relatively small due to the smaller size of the turfgrass industry in Utah, but we are an important regional program for stress tolerance and water conservation. All of our research work centers around water.