

INTRODUCTION

This booklet provides basic information specific to the Turfgrass Science major. Information common to all undergraduate programs can be found at

<https://bulletins.psu.edu/search/?scontext=programs&search=turfgrass+science>. Course scheduling information is available at https://public.lionpath.psu.edu/psp/CSPRD/EMPLOYEE/SA/h/?tab=PE_PT_NVT_PUBLIC_HOME.

The Turfgrass Science major is part of the Department of Plant Science in the College of Agricultural Sciences. Dr. Erin Connelly (119 Tyson) is the Department Head. The Turfgrass Science major is coordinated by Dr. Andrew McNitt (445 ASI--863-1368; asm4@psu.edu). Advising support is provided by Dianne Petrunak (242 ASI--863-0139; dmp6@psu.edu). On the following pages are profiles of each turf participant; you will be assigned one of these faculty as your advisor for internships, career planning, and curriculum issues.

FACULTY INVOLVED IN THE TURFGRASS SCIENCE MAJOR

PENN STATE: University Park, PA

Jeffrey Borger	Senior Instructor of Turf & Weed Mgmt	JBorger@psu.edu	244 ASI	865-3005
David R. Huff	Professor Turf Breeding & Genetics	drh15@psu.edu	210 ASI	863-9805
John Kaminski	Professor of Turfgrass Management	kaminski@psu.edu	16 Tyson	865-3007
Brad Jakubowski	Instructor of Agronomy	brj8@psu.edu	206 Tyson	865-7118
Peter J. Landschoot	Professor of Turfgrass Science	pj11@psu.edu	413 ASI	863-1017
Benjamin McGraw	Assoc. Prof. of Turfgrass Science	bam53@psu.edu	243 ASI	865-1138
Andrew S. McNitt	Professor of Soil Science	asm4@psu.edu	445 ASI	863-1368
Maxim Schlossberg	Assoc. Prof. Turf Nutrition/Soil Fertility	mjs38@psu.edu	403 ASI	863-1015
Wakar Uddin	Professor of Plant Pathology	wxu2@psu.edu	211 Buckhout Lab	863-4498

PENN STATE: Berks-Lehigh Valley College, Reading, PA

Michael Fidanza	Prof. Horticulture-Turfgrass Ecology	maf100@psu.edu	Berks Campus	610-396-6330
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Jeffrey A. Borger
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Appointed to the department of Plant Science: 1991

Education:

B.S. The Pennsylvania State University, 2000
M.S. The Pennsylvania State University, 2004

Teaching Profile:

TURF 230 - Turfgrass Pesticides (Resident)
TURF 230 - Turfgrass Pesticides (World Campus)
TURF 238 - Controlling Weeds in Turf and Ornamentals (Resident)
TURF 238 - Controlling Weeds in Turf and Ornamentals (World Campus)
TURF 425 - Turfgrass Cultural Systems (Resident)
TURF 425 - Turfgrass Cultural Systems (World Campus)
TURF 489 - Supervised Experience in College Teaching (Resident)
TURF 490 - Colloquium (Resident)
TURF 495 - Turfgrass Internship (Resident)
TURF 496 - Turfgrass Independent Studies (Resident)
TURF 923A - Weed Control in Turfgrass (2 year Golf Turf Management Program)
TURF 925A - Turfgrass Cultural Systems (2 year Golf Turf Management Program)

Research Profile

At Penn State University, I have the responsibility of managing a turfgrass field research program that encompasses the evaluations of grassy and broadleaf weed control, and plant growth regulators. The findings of this research provides information to many companies developing materials for the green industry and differencing state and federal agencies for policy issues.

Significant Honors and Awards

KAFMO - Waddington/Harper Scholarship, 2003
Phi Kappa Phi, 2001
Bayer Turfgrass Scholarship, 2000
Gamma Sigma Delta, 1999
United States Golf Association Internship, 1998.

Selected Publications Since 1995

Borger, J. A., Naedel, M. B. and Hivner, K. 2012. Seedhead Suppression of an Annual Bluegrass Putting Green. Proceedings of the Northeastern Weed Science Society 66:96.
Borger, J. A. and M. B. Naedel, and K. Hivner. 2012. Late Fall and Early Spring Application of Granular Preemergence Herbicide on a Fertilizer Carrier for Season Long Crabgrass Control. Journal of Environmental Horticulture, Vol. 29 (2), pp. 65-70, June 2011.
Richards, K., Borger, J. A. Posted on April 30th, 2012. "Need Help Identifying Those Spring Weeds".
<http://blog.pested.psu.edu/2012/04/30/need-help-identifying-those-spring-weeds/>
Lawn Care Tips: Preemergence Crabgrass Control Strategies for the Lawn Care Operator. Jeffrey Borger. Winter 2012 Pennsylvania Turfgrass Magazine, Vol. 1, No.2, pp. 17-19.
Influence of Foliar Moisture on Postemergent Granule Herbicide Control of White Clover and Dandelion in Cool-Season Turf. Loughner, Dan, Nolting, Steven P., Borger, J. A., Naedel, M. B., and Hivner, K. Online Journal, Applied Turfgrass Science doi:10.1094/ATS-2010-0713-01-RS.
Reicher, Zachary J., Daniel V. Weisenberger, Michael W. Melichar, Daniel L. Loughner, Jeffrey A. Borger, and Matthew B. Naedel. Late Fall and Early Spring Application of Granular Preemergence Herbicide on a Fertilizer Carrier for Season-Long Crabgrass Control. Journal of Environmental Horticulture. 29(2):65-70. June 2011
Borger, J. A. and Naedel, M. B. and Hivner, K. 2011. Pre – and Post – Emergence Annual Bluegrass Control. Proceedings of the Northeastern Weed Science Society 65:83.
Linde, D. T., Watschke, T. L. and Borger, J. A. 1996. Tracking Turf Runoff. Grounds Maintenance. March 1996. 4 pp.
Linde, D. T., Watschke, T. L., Jarrett, A. R. and Borger, J. A. 1995. Surface Runoff Assessment From Creeping Bentgrass and Perennial Ryegrass Turf. Agron. J. 87:176-182.

Mike Fidanza
Professor of Horticulture

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Appointed to the Penn State Berks-Lehigh Valley College in 2000 (formerly employed as a research scientist with industry).

Education:

B.S. Pennsylvania State University, 1987
M.Agr. Pennsylvania State University, 1989
Ph.D. University of Maryland, 1995

Teaching Profile:*

TURF 235 The Turfgrasses
SOILS 101 Introduction to Soils
HORT 101 Horticultural Science
BIOL 020 Plants, People, and Places (BIOL 027 to be offered in the future)

*Courses currently available at the Berks-Lehigh Valley College that may be used to fulfill supporting areas:

<u>COURSES for the TURFGRASS MAJOR:</u>		<u>PROFESSIONAL MGMT and ECONOMICS:</u>	<u>PROFESSIONAL AGRICULTURE:</u>
AG 150S	ECON 002	ACCTG 211	HORT 101
AG EC 101	ENGL 015	B A 250 and 355	HORT 131
BIOL 011	ENGL 202C/D	ECON 004	HORT 137
BIOL 012	GEOSC 020	FIN 100	HORT 138
CHEM 012	MATH 021	INS 301	HORT 202
CHEM 013	SPCOM 100	MGMT 100	HORT 430W
CHEM 034	TURF 235	MKTG 220 AND 221	PHYS 150
CMPS 203	SOILS 101	MKTG 301	PHYS 151

Research Activities and Interests:

- teaching methods in turfgrass science, horticulture, and botany
- turfgrass integrated pest management, particularly weed ecology and disease forecasting
- turfgrass establishment and maintenance
- Facilities at Penn State's Berks Campus: - Horticulture Education and Research Center (greenhouse, field plots)
- Environmental Horticulture Laboratory

Outreach Activities and Interests:

- support Penn State's turfgrass teaching, research, and extension program
- support the Green Industry in Southeastern Pennsylvania

Significant Honors and Awards since 1995:

- 1994 Outstanding Graduate Student – American Society of Agronomy (Northeastern Branch)
- 2000 “Top 40 under the age of 40” Green Industry Professionals - Golfweek's Superintendent News

Selected Publications since 1995:

Fidanza, M.A. and B.J. Johnson. 2001. Suppressing bermudagrass in cool-season turf. Golf Course Mgmt, April issue.
Fidanza, M.A. and P.H. Dernoeden. 1997. A review of brown patch forecasting, pathogen detection, and management strategies for turfgrasses. International Turfgrass Research Journal 8:863-874.
Fidanza, M.A. and P.H. Dernoeden. 1996. Brown patch severity in perennial ryegrass as influenced by irrigation, fungicide, and fertilizers. Crop Science 36:1631-1638.
Fidanza, M.A., P.H. Dernoeden, and A.P. Grybauskas. 1996. Development and field validation of a brown patch warning model for perennial ryegrass turf. Phytopathology 86:385-390.
Fidanza, M.A., P.H. Dernoeden, and M. Zhang. 1996. Degree-days for predicting smooth crabgrass emergence in cool-season turfgrass. Crop Science 36:990-996.

David R. Huff
Professor of Turf Genetics

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Appointed to the Department of Crop and Soil Sciences: 1994

Education:

BS Michigan State University, 1980
MS University of California-Davis, 1983
PhD University of California-Davis, 1988

Teaching Profile:

Dr. Huff's teaching responsibility involves a three credit undergraduate non-turf major course called "Introduction to Turfgrass Management (TURF 100), and an eight week non-degree course also called "The Turfgrasses" (AGRO 936A). He is expected to educate graduate students through supervision and participation on graduate theses committees.

Along with Dr. Huff's more formal activities, he stays current in his field by attending regional, national, and international scientific meetings, and participates in committee service. He also provides national leadership in turfgrass breeding and genetics, and represents the Department of Plant Science and the University at the local, regional, and national levels.

Research Profile:

Dr. Huff was appointed in July 1994 to conduct research in the area of turfgrass breeding and genetics and to teach in the area of turfgrass science. His time allocation is 75% in Research and 25% in Teaching. He initially supervised one full-time employee as part of his research project. As of May 1995, he has added an additional full-time Research Associate through his efforts in securing external funding sources. Dr. Huff is an authority at the Pennsylvania State University in plant reproductive biology and ecology, the application and analysis of molecular genetic markers for population and ecological genetic studies, plant breeding and quantitative genetics, and other issues pertaining to turfgrass culture and maintenance.

Dr. Huff's primary assignment is to serve as Penn State's turfgrass breeder and research geneticist. This assignment includes conducting basic and applied research in the area of turfgrass genetics and plant breeding. He is responsible for developing improved turfgrass varieties for use in commercial production and for developing new breeding methodologies through the application of molecular genetic techniques. Ultimately, he is responsible for ensuring that the citizens of Pennsylvania have adapted high-quality turfgrass cultivars for use in various sectors of the turfgrass industry, including sports turf, home lawns, and utility areas. He publishes his results in scientific journals and presents at national and regional scientific meetings.

Selected Publications Since 1995:

- Huff, D. R. and A. J. Palazzo. 1998. Fine fescue species determination by laser flow cytometry. *Crop Science* 38:445-450.
- Huff, D. R., J. A. Quinn, B. Higgins and A. Palazzo. 1998. RAPD variation among native little bluestem [*Schizachyrium scoparium* (Michx.) Nash] populations from sites of high and low fertility in forest and grassland biomes. *Molecular Ecology* 7:1591-1597.
- Weir, T. L., D. R. Huff, B. J. Christ and C. P. Romaine. 1998. RAPD-PCR analysis of genetic variation among isolates of *Alternaria solani* and *Alternaria alternata* from potato and tomato. *Mycologia* 90:813-821.

Peter J. Landschoot
Professor of Turfgrass Science

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Appointed to the Department of Plant Science (formerly Dept. Crop and Soil Science): 1989

Education:

BS The Pennsylvania State University, 1982
MS The Pennsylvania State University, 1984
PhD University of Rhode Island, 1988
Post-Doctoral Research Associate, Rutgers University, 1988-1989

Extension Profile:

Responsible for Penn State's turfgrass extension program, including: coordinating turfgrass conferences, developing educational resources, presenting research-based information on turfgrass management at local, regional, and statewide grower meetings, and responding to clientele needs.

Research Profile:

Responsible for research in the area of turfgrass management. Currently conducting research on nutrient management of turfgrass systems (improving efficiency of nitrogen and phosphorus fertilization), compost use and soil improvement, turfgrass wear tolerance, and suppression of turfgrass diseases using cultural practices.

Teaching Profile:

Turf 436W - Case Studies in Turfgrass Management
Turf 956A - Case Studies in Golf Turf Management

Significant Honors and Awards:

ASA Educational Materials Award
PA Technical Assistance Program – Award of Special Recognition
PA Turfgrass Council Distinguished Service Award

Selected Publications Since 2005:

Landschoot, P.J., A. Wolf, and J. Schenk. 2014. Summary of Mehlich-3 P data from home lawn soil tests in Pennsylvania. *Applied Turfgrass Science* (11) 1, 1-2. <https://www.agronomy.org/publications/ats/articles/11/1/ATS-2014-0048-BR>

Lyons, E.M., P.J. Landschoot, and D.R. Huff. 2011. Root distribution and tiller densities of creeping bentgrass cultivars and greens-type annual bluegrass cultivars in a putting green. *HortScience*. 46(10):1411-1417.

Delvalle, T., P.J. Landschoot, and J.E. Kaminski. 2011. Effects of dew removal and mowing frequency on fungicide performance for dollar spot control. *Plant Disease*. 95:1427-1432.

Aamlid, T.S., P.J. Landschoot, and D. Huff. 2009. Tolerance to simulated ice encasement and *Microdochium nivale* in USA selections of greens-type *Poa annua*. *Acta Agriculturae Scandinavica, Section B – Soil & Plant Science* 59(2):170–178.

Cook, P.J., P.J. Landschoot, and M.J. Schlossberg. 2009. Inhibition of *Pythium* spp. and suppression of *Pythium* blight of turfgrasses with phosphonate fungicides. *Plant Disease* (93) 809–814.

Aamlid, T. and P.J. Landschoot, 2007. Effect of spent mushroom substrate on seed germination of cool-season turfgrasses. *HortScience* 42(1):161–167.

Schlossberg, M.J., F.C. Waltz, Jr., P.J. Landschoot, and B.S. Park. 2008. Recent mechanical cultivation of lawns enhances lime application efficacy. *Agronomy Journal* 100(3):855–861.

Landschoot, P.J. and M. Mocioni. 2005. Lotta alle infestanti del tappeto erboso (Weed control in turfgrass). *Informatore Fitopatologico La Difesa Della Pianta*. 7–8:21–32.

Benjamin A. McGraw
Associate Professor of Turfgrass Entomology

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Appointed to the Department of Plant Science: 2014

Education:

BS University of Maine, 1998
MS University of Massachusetts- Amherst, 2005
PhD Rutgers University, 2009

Teaching Profile:

Dr. McGraw's teaching responsibility involves teaching Turfgrass Insect Pest Management in the 2- (ENT 952A) and 4-yr resident and World Campus programs (ENT 317). Starting in Fall 2015 he will be responsible for teaching "The Turfgrass" (TURF 235) to World Campus students. He also advises undergraduate and graduate students, assists with Turf Club advising, and mentors the Turf Bowl teams.

Research Profile:

Dr. McGraw's research program focuses on understanding the biology and ecology of turfgrass insect populations to improve current management practices and develop novel, more sustainable management and monitoring programs. Given the heavy reliance on chemical controls in many managed turfgrass systems, little is known about the ecology of many soil arthropod pests and communities. To improve this, he has used the annual bluegrass weevil (*Listronotus maculicollis* Kirby), a severe and widespread pest of intensely managed turfgrass, as a model organism. Additional areas of study include long-term dynamics and improved use of entomopathogenic nematodes in turfgrass systems, the effects of cultural controls on turf pest abundance, and the behavior and reproductive ecology of turf pest populations.

Selected Publications:

- McGraw, B.A., C. Rodriguez-Saona, R. Holdcraft, Z. Szendrei and A.M. Koppenhöfer. 2011. Behavioral and electrophysiological responses of *Listronotus maculicollis* (Coleoptera: Curculionidae) to volatiles released from intact and mechanically damaged turfgrass. *Environmental Entomology* 40 (2): 412-419.
- McGraw, B.A. and A.M. Koppenhöfer. 2010. Spatial distribution of colonizing *Listronotus maculicollis* populations: implications for targeted management and host preference. *Journal of Applied Entomology*. 134: 275-284.
- McGraw, B.A., P. J Vittum, R.S. Cowles and A.M. Koppenhöfer. 2010. Field evaluation of entomopathogenic nematodes for the biological control of the annual bluegrass weevil, *Listronotus maculicollis* (Coleoptera: Curculionidae) in golf course turfgrass. *Biocontrol Science and Technology*. 20 (2): 149-163.
- McGraw, B.A. and A.M. Koppenhöfer. 2009. Development of binomial sequential sampling plans for forecasting *Listronotus maculicollis* (Coleoptera: Curculionidae) larvae based on the relationship to adult counts and turfgrass damage. *Journal of Economic Entomology* 102(3): 1325-1335.
- McGraw, B.A. and A.M. Koppenhöfer. 2009. Population dynamics and interactions between endemic entomopathogenic nematodes and annual bluegrass weevil populations in golf course turfgrass. *Applied Soil Ecology* 41: 77-89.
- McGraw, B.A. and A.M. Koppenhöfer. 2008. Evaluation of two endemic and five commercial entomopathogenic nematode species (Rhabditida: Heterorhabditidae and Steinernematidae) against annual bluegrass weevil (Coleoptera: Curculionidae) larvae and adults. *Biological Control* 46: 467-475.

Andrew S. McNitt
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Appointed to the Department of Crop and Soil Sciences: 1983

Education:

BS The Pennsylvania State University, 1983
MS The Pennsylvania State University, 1993
PhD The Pennsylvania State University, 2000

Teaching Profile:

Turf 235 – The Turfgrasses
Turf 434 via Internet to distant education students
Turf 434 – Turfgrass Soils

Research Profile:

Major college and professional sports are a significant part of the entertainment industry, and participation in recreational sports is increasing nationwide. The athletic field surface is the stage or backdrop to those activities. Research at the Penn State Plant Science Department's Center for Turfgrass Science strives to create safer, more durable, more functional athletic field surfaces for sporting events from grade schools to the professional stadiums. We are evaluating the effectiveness of maintenance procedures in reducing athlete injury at the high school and grade school level. We also are developing mobile natural turfgrass systems that enable stadium managers to rotate fresh sections of grass into heavily worn areas or even remove the turfgrass altogether for concerts and other non-athletic events. Funding sources include industry (Nike, Dupont), the PGA (Professional Golfers Association), and the NFL (National Football League). We are providing the knowledge necessary to create the safest, highest-quality turfgrass at the lowest cost, and are seeking highly qualified and motivated graduate students who wish to contribute to the science that supports the increasingly sophisticated sports turf industry.

Significant Honors and Awards Since 1995:

The American Society of Agronomy – 1995
Sports Turf Managers Association – 1997
Golf Course Superintendents Association of America – 1997
The Musser International Turfgrass Foundation – 1998

Selected Publications Since 1995:

McNitt, A. S., D. V. Waddington, and R. O. Middour. 1996. Traction measurement on natural turf. Safety in American Football. ASTM STP 1305, Earl F. Hoerner, Ed., American Society for Testing and Materials. pp. 145-155.

Waddington, D. V., A. S. McNitt, and P. J. Landschoot. 1996. Constructing and maintaining safe playing surfaces. International Symposium on Safety in Baseball and Softball. ASTM STP 1313, Earl F. Hoerner and Frances A. Cosgrave, Eds., American Society for Testing and Materials.

McNitt, A. S., R. O. Middour, and D. V. Waddington. 1997. Development and evaluation of a method to measure traction on turfgrass surfaces. Journal of Testing and Evaluation. ASTM Vol. 25, No. 1, Jan. pp. 99-107.

Landschoot, P. J. and A. S. McNitt. 1997. Effect of nitrogen fertilizers on suppression of dollar spot disease of creeping bentgrass. International Turfgrass Society Research Journal Vol. 8. pp. 905-911.

McNitt, A. S., D. V. Waddington, and R. O. Middour. 1998. Effects of turfgrass and soil conditions on traction. Crop Science Society of America. (in progress)

Maxim J. Schlossberg
Associate Professor of Turfgrass Nutrition and Soil Fertility
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814-863-1015
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Appointed to the Department of Crop and Soil Sciences: 2002

Education:

BS	Texas A&M University, 1994
MS	University of Georgia, 1999
PhD	University of Georgia, 2002

Teaching Profile:

Responsible for teaching SOIL 922A—'Turfgrass Nutrition' in the Golf Course Turfgrass Management Program. The course objectives are to inform students: (1) of the function of nutrients in the plant, (2) how soil physical and chemical properties affect nutrient availability and plant root function, (3) how to choose and apply fertilizers on the basis of soil and tissue test results, and (4) how to formulate nutrient management plans. Student learning is interactive and problem-based. Also responsible for teaching TURF 435—Turfgrass Nutrition.

Research Profile:

Primary assignment is to improve current soil sampling, analysis, interpretation and recommendation methods for optimization of turfgrass maintenance in Pennsylvania. Approaches to accomplish this objective include: (1) Determination of cultivation and lime application practices for improved efficacy of soil acidity amelioration in perennial turfgrass systems, (2) evaluation of soil amendments for improved nutrient-use efficiency, (3) evaluation of the base cation saturation ratio (BSCR) method for interpretation of soil nutrient test results and assignment of fertilizer recommendations, and (4) use of geospatial soil analysis for advisement of soil sampling protocol in nutrient management of golf course putting greens.

Significant Honors and Awards:

1999—University of Georgia, Outstanding Graduate Teaching Award
1998—National Association of Colleges and Teachers of Agriculture (NACTA), Graduate Student Teaching Award

Selected Publications Since 2002:

Schlossberg, M.J. and W.P. Miller. 2003. Coal combustion by-product (CCB) utilization in turfgrass sod production. *HortScience* (*in press*).

Schlossberg, M.J., K.J. Karnok and G. Landry, Jr. 2002. Estimation of viable root length density of heat-tolerant creeping bentgrass cultivars, 'Crenshaw' and 'L93', by an accumulative degree day model. *J. Am. Soc. Hort. Sci.* 127:224-229.

Schlossberg, M.J. and K.J. Karnok. 2002. Use of transparent columns for demonstrating water movement in golf green root zones. *J. Nat. Resour. Life Sci. Education* 31:1-4.

Wakar Uddin
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Appointed to the Department of Plant Pathology and Environmental Microbiology: 1998

Education:

B.S. University of Nevada
M.S. University of Nevada
Ph.D. University of Georgia

Program Interests:

The turfgrass industry is a billion dollar business in Pennsylvania. Golf courses, landscapes, athletic fields, business and residential lawns, and sod production all represent significant components of the turf industry. Maintaining high quality turf is one of the top priorities of the turf industry. Diseases such as gray leaf spot, take-all patch, dollar spot, brown patch, and snow molds pose significant challenges for the industry in producing and maintaining a high quality turf.

My research program is primarily directed toward the management of gray leaf spot of perennial ryegrass caused by *Pyricularia grisea*, through applications of the principles of plant disease epidemiology, biology of the pathogen, and host-pathogen interactions. The epidemiological research focuses on the influence of environmental conditions on development of gray leaf spot epidemics under the current and newly emerging turf management practices, including fertility, alternative and new turfgrass mixtures and blends, pesticides and growth regulators, and plant residue management practices. Research on biology of the pathogen entails characterization of *P. grisea*, based on the concepts and methods in mycology and molecular biology in relation to virulence and genetics of host-pathogen interactions. A second component of my research program encompasses biology of the take-all pathogen (*Gaeumannomyces graminis* var. *avenae*) and suppression of take-all under intensely managed golf greens and fairways. Evaluation of fungicides will remain an essential component of the turfgrass disease management program. I will continue to work with the agricultural chemical industry in developing the most effective and environmentally safe uses of fungicides as part of an integrated turfgrass management system.

I provide disease diagnostic services and management recommendations to the turfgrass industry in Pennsylvania. I also participate in Penn State's World Campus distance education program.

Publications:

- Uddin, W., Stevenson, K. L., Pardo-Schultheiss, R. A., and Rehner, S. A. 1998. Pathogenic and molecular characterization of three *Phomopsis* isolates from peach, plum, and Asian pear. *Plant Dis.* 82:732-737
- Uddin, W., and Stevenson, K. L. 1998. Seasonal development of *Phomopsis* shoot blight of peach and effects of selective pruning and shoot debris management on disease incidence. *Plant Dis.* 82:565-568
- Uddin, W., Stevenson, K. L., and Pardo-Schultheiss, R. A. 1997. Pathogenicity of *Phomopsis* sp. on peach causing shoot blight and evaluation of possible infection courts. *Plant Dis.* 81:983-989
- Uddin, W., and McCarter, S. M. 1996. First report of *Rhododendron* leaf spot caused by *Pseudomonas cichorii*. *Plant Dis.* 80:960
- Uddin, W., McCarter, S. M., and Gitaitis, R. D. 1996. First report of bacterial leaf spot on oakleaf hydrangea caused by a pathovar of *Xanthomonas campestris*. *Plant Dis.* 80:599

TURFGRASS SCIENCE AS A MAJOR

Turfgrass science involves the study of grasses, soils, ornamentals, and the various pests that can affect turf in combination with specific business and management courses to provide students with the necessary academic background to contribute to the turfgrass industry. Employment opportunities exist throughout the industry on golf courses, athletic field management, in lawn and landscaping, sales and service, agrichemical industry, cemetery management, roadside vegetation management, environmental consulting firms, sod farms, government agencies, and many others.

WHY MAJOR IN TURFGRASS SCIENCE?

A major in turfgrass science might appeal to you if you want to:

- Help provide high quality, safe recreational areas
- Help enhance the environment and provide quality landscapes
- Understand the various roles of turf in land use and planning decisions

CAREER OPPORTUNITIES FOR TURFGRASS SCIENCE GRADUATES

- Golf Course Superintendent -Organizes and directs maintenance of public and private golf course facilities
- Athletic Field Manager - Organizes and directs maintenance of athletic fields and grounds
- Lawn Specialist -Works with professional lawn care company to supply expertise and service to residential and commercial property owners.
- Landscape Contracting and Maintenance Specialist -Works with landscape contracting and maintenance firms to supply expertise and service to residential and commercial property owners
- Vegetation Manager -Work with Department of Transportation to provide expertise in managing vegetation along roadsides
- Industrial Representative -Sells and services turfgrass products, including equipment, fertilizers, seed, pesticides, and others
- Conservationist -Work with environmental consulting firms to help landowners and users control erosion and pollution; promotes the wise use of natural resources
- Cemetery Manager -Organizes and directs maintenance of landscapes of large cemetery operations
- Research Aide -Helps conduct field and laboratory research experiments
- Sod Farm Manager -Uses sound management practices to increase productivity
- International Turfgrass Specialist -Assists with development and establishment of golf courses in foreign countries
- Turfgrass Scientist -After graduate training, may work in university teaching, research, or extension or participate in industrial research and development

Suggested Academic Plan for Turfgrass Science Major (TURF at UP)

Semester 1	Credits	Semester 2	Credits
<i>BIOL 110 (GN)</i>	4	<i>ENGL 15</i>	3
CHEM 110 or CHEM 130	3	CHEM 202	3
<i>MATH 21 (GQ)</i>	3	<i>METEO 101/3 (GN)</i>	3
General Education Course	3	General Education Course	3
AG 150S (First-Year Seminar)	2	Supporting Course	3
Total Credits	15	Total Credits	15
Semester 3	Credits	Semester 4	Credits
SOILS 101	3	TURF 230	1
TURF 235	3	ENT 317	3
<i>STAT 200 (GQ)</i>	4	General Education Course	3
<i>BIOL 127 or HORT 101 (GN)*</i>	3	General Education Course	3
General Education Course (GHW)	1.5	Supporting Course	3
		General Education Course (GHW)	1.5
Total Credits	14.5	Total Credits	14.5
Semester 5	Credits	Semester 6	Credits
TURF 238	3	TURF 435	4
TURF 434	3	<i>CAS 100 (GWS)</i>	3
TURF 307	3	TURF 495 (Internship)	1
General Education Course	3	Supporting Course	3
Supporting Course	3	AGBM 106	3
		Elective	3
Total Credits	15	Total Credits	17
Summer Term	Credits		
TURF 495 (Internship)	1		
Semester 7	Credits	Semester 8	Credits
PPEM 412	3	TURF 436W	3
TURF 425	3	General Education Course	3
<i>ENGL 202C or D (GWS)</i>	3	Supporting Courses	6
Supporting Courses	6	TURF 490 (Seminar)	1
TURF 495 (Internship)	1		
Total Credits	16	Total Credits	13

Bold type indicates courses requiring a grade of C or better.

Italics indicates courses that satisfy both major and General Education requirements.

Bold Italics indicates courses requiring a grade of C or better and satisfy both major and General Education requirements.

GWS, GHA, GQ, GN, GA, GH, and GS are codes used to identify General Education requirements.

US and IL are codes used to designate courses that satisfy University United States/International Cultures requirements.

W is used to designate courses that satisfy University Writing Across the Curriculum requirements.

Recommended Academic Plan for Turfgrass Science Major (TURF at Berks)

Semester 1	Credits	Semester 2	Credits
<i>ENGL 15</i>	3	<i>BIOL 110 (GN)</i>	4
CHEM 101, 130, or 110	3	SOILS 101	3
<i>MATH 21 (GQ)</i>	3	<i>METEO 101/3 (GN)</i>	3
General Education Course	3	General Education Course	3
PSU 5 (First-Year Seminar)	1	Supporting Course	3
Total Credits	13	Total Credits	16
Semester 3	Credits	Semester 4	Credits
CHEM 202	3	TURF 230	1
TURF 235	3	<i>CAS 100 (GWS)</i>	3
General Education Course	3	<i>STAT 200 (GQ)</i>	4
Supporting Course	3	General Education Course	3
General Education Course (GHW)	1.5	Supporting Course	3
		General Education Course (GHW)	1.5
Total Credits	13.5	Total Credits	15.5
Semester 5	Credits	Semester 6	Credits
TURF 238	3	TURF 435	4
TURF 434	3	ENT 317	3
<i>BIOL 127 or HORT 101 (GN)*</i>	3	TURF 495 (Internship)	1
AGBM 106	3	Supporting Courses	6
General Education Course	3	Elective	3
Total Credits	15	Total Credits	17
Summer Term	Credits		
TURF 495 (Internship)	1		
Semester 7	Credits	Semester 8	Credits
PPEM 412	3	TURF 436W	3
TURF 425	3	General Education Course	3
TURF 307	3	Supporting Courses	6
<i>ENGL 202C or D (GWS)</i>	3	TURF 490 (Seminar)	1
Supporting Course	3	Elective	1
TURF 495 (Internship)	1		
Total Credits	16	Total Credits	14

Bold type indicates courses requiring a grade of C or better.

Italics indicates courses that satisfy both major and General Education requirements.

Bold Italics indicates courses requiring a grade of C or better and satisfy both major and General Education requirements.

GWS, GHA, GQ, GN, GA, GH, and GS are codes used to identify General Education requirements.

US and IL are codes used to designate courses that satisfy University United States/International Cultures requirements.

W is used to designate courses that satisfy University Writing Across the Curriculum requirements.

*Students should schedule BIOL 127 their first fall semester at University Park

Recommended Academic Plan for Turfgrass Science Major (TURF at other campuses)

Semester 1	Credits	Semester 2	Credits
<i>ENGL 15</i>	3	<i>BIOL 110 or BIOL 11 & 12 (GN)</i>	4
CHEM 101, 130, or 110	3	SOILS 101^a	3
<i>MATH 21 (GQ)</i>	3	CHEM 202^b	3
General Education Course	3	<i>METEO 101/3 (GN)</i>	3
First year seminar	1	General Education Course	3
Health and Physical Activity (GHW)	1.5		
Total Credits	14.5	Total Credits	16
Semester 3	Credits	Semester 4	Credits
CHEM 202^b	3	TURF 230	1
<i>CAS 100 (GWS)</i>	3	<i>ENGL 202C or D (GWS)</i>	3
General Education Course	3	<i>CMPSC 203 (GQ)^c</i>	4
Supporting Course ^d	6	General Education Course	3
General Education Course (GHW)	1.5	Supporting Course ^d	3
		General Education Course (GHW)	1.5
Total Credits	16.5	Total Credits	15.5
Semester 5	Credits	Semester 6	Credits
TURF 235	3	TURF 435	4
TURF 238	3	ENT 317	3
General Education Course	3	Supporting Course ^d	3
<i>BIOL 127 or HORT 101 (GN)^e</i>	3	Elective/Supporting Course	3
Supporting Course ^d	3	TURF 495 (Internship)	1
		AGBM 106	3
Total Credits	15	Total Credits	17
Summer Term	Credits		
TURF 495 (Internship)	1		
Semester 7	Credits	Semester 8	Credits
PPEM 412	3	TURF 436W	3
TURF 425	3	General Education Course	3
TURF 434	3	Supporting Courses ^d	6
Arts/Humanities/Soc Sci (GA/GH/GS)	3	TURF 490 (Seminar)	1
TURF 307	3	Elective	1
TURF 495 (Internship)	1		
Total Credits	16	Total Credits	14

Bold type indicates courses requiring a grade of C or better.

Italics indicates courses that satisfy both major and General Education requirements.

Bold Italics indicates courses requiring a grade of C or better and satisfy both major and General Education requirements.

GWS, GHA, GQ, GN, GA, GH, and GS are codes used to identify General Education requirements.

US and IL are codes used to designate courses that satisfy University United States/International Cultures requirements.

W is used to designate courses that satisfy University Writing Across the Curriculum requirements.

This plan is intended as a guideline. Suggested courses may not be offered at all campuses in a particular semester.

^a Offered residently at AA & DS. Students at BD, CL, DE, MK may take this course online if they choose. Otherwise, students should take this course at UP.

^b Offered at CL, DS, & SV in spring semester. Offered at AA in fall semester.

^c Offered only at AA, BD, & MK. Other students should schedule this course at UP.

^d For a list of approved supporting courses in Professional Management and Professional Agriculture, see <http://plantscience.psu.edu/majors/turfgrass>.

^e Students should schedule BIOL 127 their first fall semester at UP.

**DEPARTMENTAL APPROVED COURSE LIST THAT MAY BE USED TO FULFILL
SUPPORTING COURSES UNDER PROFESSIONAL MGMT. & ECONOMICS
(9 of the 15 credits must be from bolded list)**

ACCTG 211 Financial and Managerial Accounting for Decision Making (Prereq) (4)

AEE 201 (GS) Interpersonal Skills for Tomorrow's Leaders (3)

AG BM 101 Economic Principles of Agribusiness Decision Making (3)

AG BM 200 Introduction to Agricultural Business Management (3)

AG BM 220 Agribusiness Sales & Marketing (3)

B A 100 Introduction to Business (3)

B A 241 Legal Environment of Business (2)

B A 242 Social & Ethical Environment of Business (2)

B A 243 Social, Legal, & Ethical Environment of Business (4)

B A 250 Problems of Small Business (Prereq) (3)

BA 301 Finance (Prereq) (3) formerly FIN 100

B A 303 Marketing (Prereq) (3) formerly MKTG 221

B A 304 Management & Organization (Prereq) (3) formerly MGMT 100

B LAW 243 Legal Environment of Business (Prereq) (3)

COMM 100 (GS) The Mass Media and Society (3)

COMM 118 (GS) Introduction to Media Effects (3)

COMM 170 Introduction to the Sports Industry (3)

COMM 180 (GS) Survey of Electronic Media & Telecommunications (3)

ECON 102 (GS) Introductory Microeconomic Analysis and Policy (3)

ECON 104 Introductory Macroeconomic Analysis and Policy (3)

ECON 315 Labor Economics (Prereq) (3)

FIN 108 Personal Finance (Prereq) (3)

FIN 301 Corporate Finance (3)*

INTAG 100 (GS/IL) Introduction to International Agriculture (3)

IST 110 (GS) Information, People and Technology (3)

IST 210 Organization of Data (4)

LER 100 (GS) Employment Relations (3)

LER 201 (GS) Employment Relationship: Law and Policy (3)

LER 136 (US) Race, Gender, and Employment (3)

MGMT 301W Basic Management Concepts (Prereq) (3)*

MGMT 326 Organizational Behavior & Design (Prereq) (3)*

MGMT 341 Human Resource Management (Prereq) (3)*

MGMT 420 Negotiation & Conflict Management (Prereq) (3)

M I S 204 Introduction to Business Information Systems (Prereq) (3)*

MIS 390 Information Systems Management & Applications (Prereq) (3)

MKTG 301 Principles of Marketing (Prereq) (3)*

RPTM 120 (IL) Leisure and Human Behavior (3)

RPTM 210 Introduction to Commercial Recreation & Tourism (2)

RPTM 235 Leadership & Group Dynamics in Recreation Services (3)

RPTM 277 (US) Recreation for Persons with Disabilities (3)

RPTM 300Y (IL) Tourism & Leisure Behavior (3)

RPTM 320 Recreation Resource Planning and Management (3)

RPTM 360 Golf Operations Management (Prereq) (3)

RPTM 410 Marketing of Recreation Services (Prereq) (3)

RPTM 415 Commercial Recreation Management (Prereq) (3)

R SOC 11 (US) Introductory Rural Sociology (3)

SCM 200 Introduction to Statistics for Business (Prereq) (4)

*Course registration controlled

DEPARTMENTAL APPROVED COURSE LIST THAT MAY BE USED TO FULFILL SUPPORTING COURSES UNDER PROFESSIONAL AGRICULTURE

AG 100 Job Placement Skills and Strategies (1)
AG 150S Be a Master Student (2)
AGECO 121 Plant Stress: It's Not Easy Being Green (3)
AGECO 122/METEO 122 Atmospheric Environment: Growing in the Wind (3)
AGRO 460 Advances & Applications of Plant Biotechnology (Prereq) (3)
AN SC 215 (GS) Pets in Society (3)
A S M 101 Mechanization Principles for Production Agriculture (3)
A S M 210 Turfgrass & Outdoor Power Equipment Systems Management (Prereq) (2)
A S M 310 Power Transmission in Agriculture (Prereq) (3)
A S M 320 Combustion Engines for Mobile Equipment (Prereq) (3)
A S M 327 Soil & Water Resource Management (3)
ASTRO 1 (GN) Astronomical Universe (3)
ASTRO 5 (GN) The Sky and Planets (3)
ASTRO 6 (GN) Stars, Galaxies, and the Universe (3)
ASTRO 10 (GN) Elementary Astronomy (2)
ASTRO 11 (GN) Elementary Astronomy Laboratory (1)
BI SC 1 (GN) Structure and Function of Organisms (3)
BI SC 2 (GN) Genetics, Ecology, and Evolution (3)
BI SC 3 (GN) Environmental Science (3)
BIOL 220W (GN) Biology: Populations and Communities (Prereq) (4)
BIOL 222 Genetics (Prereq) (3)
BIOL 230W (GN) Biology: Molecules and Cells (Prereq) (4)
BIOL 240W (GN) Biology: Function and Development of Organisms (Prereq) (4)
BIOL 407 Plant Developmental Anatomy (Prereq) (3)
BIOL 414 Taxonomy of Seed Plants (Prereq) (3)
BIOL 424 Seeds of Change: The Uses of Plants (Prereq) (3)
BIOL 425/PPATH 425 Biology of Fungi (Prereq) 4
BIOL 459/HORT 459 Plant Tissue Culture & Biotechnology (Prereq) (3)
BIOL 441 Plant Physiology (Prereq) (3)
BIOL 446 Physiological Ecology (Prereq) (3)
B M B 211 Elementary Biochemistry (Prereq) (3)
B M B 212 Elementary Biochemistry Laboratory (Prereq) (1)
B M B 251 (MICRB) Molecular And Cell Biology I (Prereq) (3)
B M B 252 (MICRB) Molecular And Cell Biology II (Prereq) (3)
EARTH 2 (GN) The Earth System & Global Change (3)
EARTH 100 (GN) Environment Earth (3)
EARTH 101 (GN/US) Natural Disasters: Hollywood vs. Reality (3)
EGEE 101 (GN) Energy and the Environment (3)
EGEE 102 (GN) Energy Conservation for Environment Protection (3)
EGEE 110 Safety Science for the Rest of Your Life (3)
EM SC 101 (US/IL) Resource Wars (3)
EM SC 150 (IL) Out of the Fiery Furnace (S T S 150) (3)
ENT 202 (GN) The Insect Connection (3)
ENT 313 Introduction to Entomology (2)
ENT 314 Management of Insect Pests of Ornamentals (Prereq) (1)
ENT 410 Insect Structure & Function (Prereq) (3)
ERM 450/WFS 450 Wetland Conservation (Prereq) (3)
FOR 203 Field Dendrology (Prereq) (2)
FOR 204 Dendrology (Prereq) (2)
FOR 301/HORT 301 Principles of Arboriculture (3)
FOR 470 Watershed Management (Prereq) (3)

**DEPARTMENTAL APPROVED COURSE LIST THAT MAY BE USED TO FULFILL
SUPPORTING COURSES UNDER PROFESSIONAL AGRICULTURE**

FOR 471 Watershed Management Laboratory (Prereq) (1)
GEOSC 1 Physical Geology (3)
GEOSC 2 Historical Geology (3)
GEOSC 10 Geology of the National Parks (3)
GEOSC 20 Planet Earth (3)
GEOSC 21 Earth & Life: Origin & Evolution (3)
GEOSC 40 The Sea Around Us (3)
HORT 101 (GN) Horticultural Science (3)
HORT 131 Herbaceous Perennial and Annual Identification (Prereq) (3)
HORT 137 Ornamental Plant Materials (Trees) (Prereq) (3)
HORT 138 Ornamental Plant Materials (Shrubs) (Prereq) (3)
HORT 150 (GN) Plants in the Human Context (3)
HORT 201 Applied Arboriculture (2)
HORT 202 Plant Propagation (3)
HORT 352 Flower Arranging (2)
HORT 301 Principles of Arboriculture (Prereq) (3)
HORT 315 Environmental Effects on Horticultural Crops (Prereq) (3)
HORT 407 Plant Breeding (3)
HORT 408 Landscape Plant Establishment & Maintenance (Prereq) (4)
HORT 420 Plant Growth Regulators (Prereq) (3)
HORT 445 Plant Ecology (Prereq) (3)
INTAG 100 (GS/IL) Introduction to International Agriculture (3)
LARCH 60 (GA) History of Landscape Architecture (3)
LARCH 65(GA/US/IL) Built Environment and Culture (3)
METEO 3 (GN) Introductory Meteorology (3)
METEO 4 (GN) Weather and Risk (3)
METEO 22 The Oceans (2)
METEO 101 (GN) Understanding Weather Forecasting (3)
MICRB 106 Elementary Microbiology (3)
MICRB 107 Elementary Microbiology Laboratory (1)
PHYS 1 (GN) The Science of Physics (3)
PHYS 250L Introductory Physics (Prereq) (4)
PPATH 120 (GN) The Fungal Jungle: A Mycological Safari From Truffles to Slime Molds (3)
PPATH 300 Horticultural Crop Diseases (3)
PPATH 318 Diseases of Forest and Shade Trees (2)
PPATH 405 Microbe-Plant Interactions: Plant Diseases & Biological Control (Prereq) (3)
SOILS 71 (GN/IL) Environmental Sustainability (3)
SOILS 100 Soil Judging (1)
SOILS 102 Introductory Soil Science Laboratory (Prereq) (1)
SOILS 397A Chemistry in the Environment: Soil, Water, & Air (Prereq) (3)
SOILS 401 Soil Composition & Physical Properties (Prereq) (3)
SOILS 402 Soil Nutrient Behavior & Management (Prereq) (3)
SOILS 404 Urban Soils (Prereq) (3)
SOILS 405 Hydopedology (3)
SOILS 422 Natural Resources Conservation and Community Sustainability (3)
SOILS 412W Soil Ecology (Prereq) (3)
SOILS 416 Soil Genesis, Classification & Mapping (Prereq) (4)
SOILS 420 Remediation of Contaminated Soils (Prereq) (3)
SOILS 450 Environmental Geographic Information Systems (Prereq) (3)
SPAN 1 Elementary Spanish I (4)
SPAN 2 Elementary Spanish II (Prereq) (4)
SPAN 3 Intermediate Spanish (Prereq) (4)
SPAN 105 Spanish for Students in the Field of Agricultural Sciences (4)

**DEPARTMENTAL APPROVED COURSE LIST THAT MAY BE USED TO FULFILL
SUPPORTING COURSES UNDER PROFESSIONAL AGRICULTURE**

SPAN 106 Spanish for the Agricultural Industries (Prereq) (4)
SPAN 131(GH/US/IL) Ibero-American Civilization (3)
STAT 100 Statistical Concepts & Reasoning (3)
STAT 200 Elementary Statistics (Prereq) (4)
STAT 240** Introduction to Biometry (3)
STAT 250** Introduction to Biostatistics (3)
TURF 489 Supervised Experience in College Teaching (Prereq) 1-3
WFS 209 Wildlife & Fisheries Conservation (Prereq) (3)
WFS 300 The Vertebrates (Prereq) (3)
WFS 407 Ornithology (Prereq) (3)
WFS 408 Mammology (Prereq) (3)
WFS 460 Wildlife Behavior (Prereq) (3)

**Only one course from STAT 200, 220, 240, or 250 may be taken for credit

ENGL 202C - TECHNICAL WRITING (3)

The writing of technical reports. Primarily for juniors and seniors in technical and scientific majors. Prereq: ENGL 015 or 030; 4th-semester standing.

ENGL 202D - BUSINESS WRITING (3)

Writing reports and other common forms of business communication. Prereq: ENGL 015 or 030; 4th-semester standing.

ENT 317 - INTRODUCTION TO ENTOMOLOGY/TURF INSECT MANAGEMENT (3)

Introduction to basic entomology, covering insect diversity, identification, structure and function, and principles of management. Prereq: TURF 235, CHEM 101.

MATH 021 - COLLEGE ALGEBRA I (3)

Quadratic equations; equations in quadric form; word problems; graphing; algebraic fractions; negative and rational exponents; radicals. Prereq: MATH 004 or satisfactory performance on the mathematics proficiency examination.

PPEM 412 - TURF DISEASE MANAGEMENT (3)

Introduction to biology of turfgrass pathogens and management of cool and warm-season turfgrass diseases. Prereq: TURF 230, TURF 235, CHEM 101, BIOL 127

SOILS 101 - INTRODUCTION TO SOILS (3)

This is an introductory course in soil science. A study of the characteristics of soils and their influence on land use, environmental quality, and plant growth.

CAS 100 - EFFECTIVE SPEECH (3)

Introduction to speech communication: formal speaking, group discussion, analysis and evaluation of messages.

TURF 230 - TURFGRASS PESTICIDES (1)

Course covers chemical toxicity, formulations, environmental fate, labels, MSDS, calibration, IPM, safety, handling, storage, and Pennsylvania certification and regulations. (web-based course)

TURF 235 - THE TURFGRASS (3)

Characterization of the primary plant species used for sports, lawn and utility turf; includes turfgrass morphology, environmental adaptation, and cultural requirements.

TURF 238 - (HORT) TURF AND ORNAMENTAL WEED CONTROL (3)

Students will be introduced to the development of integrated weed management strategies utilizing a variety of cultural and chemical methods.

TURF 307 - TURFGRASS IRRIGATION AND DRAINAGE (3)

Turfgrass irrigation especially golf course systems. Sprinkler selection; piping; control systems; pumps; scheduling. Surface and subsurface golf course drainage topics.

TURF 425 - TURFGRASS CULTURAL SYSTEMS (3)

A study of turfgrass maintenance practices and how their interrelationships can be utilized to develop management systems. Prereq: SOILS 101, TURF 235

TURF 434 - TURFGRASS EDAPHOLOGY (3)

Characterization of soil physical and chemical properties for the establishment and maintenance of sports turf; includes root-zone construction. Prereq: SOILS 101 and TURF 235

TURF 435 - TURFGRASS NUTRITION (4)

Study of turfgrass nutrition and growth; emphasizing constructed and mineral soil fertility, nutrient uptake and function, and fertilizer use efficiency. Prereq: SOILS 101 and TURF 235

TURF 436W - TURFGRASS MANAGEMENT SYSTEMS (3)

Case study and discussion considering integrated management of selected turfgrass sites; emphasis on problem analysis, principle application, and decision making. Prereq: TURF 235, TURF 425

TURF 490 - COLLOQUIUM (1)

Oral presentations developed by students in consultation with course instructor. Prereq: 7th semester standing

TURF 495 - INTERNSHIP (3)

Internship is a cooperative educational program between the Turfgrass Science major in the College of Agricultural Sciences and approved employers who furnish facilities and instruction that help students acquire the skills and knowledge needed in their chosen vocation. Training supervised by student's employer. Students must submit a written report of experience.

OTHER SUGGESTED COURSES FOR TURFGRASS MAJOR**AG 150S - BE A MASTER STUDENT! (2)**

Students explore agricultural issues and research methodologies through literature review, library searches, field studies, and critical thinking. Prereq: 1st or 2nd semester standing

ACCTG 211 - FINANCIAL AND MANAGERIAL ACCOUNTING FOR DECISION MAKING (4)

Introduction to the role of accounting numbers in the process of managing a business and in investor decision making. Prereq: MATH 021 or 1.5 units of high school algebra.

AG BM 200 - ECONOMIC PRINCIPLES OF AGRIBUSINESS DECISION MAKING (3)

Introduction to economic principles and their application to real world examples of agribusiness management issues.

ECON 102 - INTRODUCTORY MICROECONOMIC ANALYSIS AND POLICY (3)

Methods of economic analysis and their use; economic aggregates; price determination; theory of the firm; distribution.

TURF 496 - INDEPENDENT STUDIES (1-18)

Individual studies in specialized topics in sciences of crops, soils, and turf. Studies can include field, laboratory, greenhouse and research problems or a library literature review on a special topic. Students are permitted to elect the faculty member in whose area he desires to investigate provided he gets prior approval. Written reports are due on research problems and the equivalent of a term paper on a library topic. The equivalent of 40 hours of work study time per semester is required to earn one credit. No more than 3 credits per semester can be scheduled in this course.

MINORS AVAILABLE AT PENN STATE UNIVERSITY

If you have an interest in developing some area of interest outside your major, minors are available in many areas. A listing of all minors available can be found on the web at: <https://bulletins.psu.edu/search/?caturl=%2Fundergraduate&search=minors>.

CAREER COUNSELING AND JOB PLACEMENT

A current list of summer jobs/internships, full-time job opportunities, and graduate school assistantships specific to turfgrass are available on the Turfgrass Science Undergraduate Curriculum section on Canvas (<https://psu.instructure.com/>).

The university has a special student and alumni service section (Career Services) located in 101 MBNA Career Service Center. Its purpose is to assist students and alumni to make judicious career decisions and to teach job-hunting skills. Visit the Center during your first semester on campus to acquaint yourself with the services provided so that you can take full advantage of them while you are here. Web site available: <https://studentaffairs.psu.edu/career>

Among counseling services provided are a one-credit course on job search skills and strategies (AG100) weekly seminars on resume writing and interview skills, and individual and group counseling on career and life planning.

Job placement services offer on-campus recruiting for employers, a limited resume - job vacancy matching service, and a correspondence course on job hunting skills.

JOB OPPORTUNITIES AS A STUDENT

There are a number of part-time job opportunities available to students during the semester (including summer). These include the Penn State Blue & White Golf Courses, the Joseph Valentine Turfgrass Research Facility, and the Beaver Stadium Grounds Crew. If you are interested in employment, contact information is below.

Penn State Golf Courses
Rick Pagett, Superintendent
rmp15@psu.edu
865-1635

Joseph Valentine Turfgrass Research Center
Tom Bettle, Manager
trb19@psu.edu
865-8154

Beaver Stadium Grounds Crew
George Peters, Supervisor
gmp5036@psu.edu
865-7071

DEPARTMENTAL ACTIVITIES

The following is a list of departmental clubs and activities. A listing of all university clubs, associations, and societies can be found on the web at: <https://studentaffairs.psu.edu/involvement-student-life/student-organizations>

TURFGRASS CLUB

The purpose of the Penn State Turfgrass Club is to provide students interested in the art of Turfgrass Management an opportunity to supplement their classroom and textbook learning with current issues and problems facing today's Turfgrass Manager.

The objective is to maintain a 'thumb on the pulse' of a constantly growing and expanding industry. The dynamic nature of this industry requires today's turfgrass manager to utilize all means possible to further his/her understanding, if they are to be successful.

The Turfgrass club is intended to be a vehicle for students to use to exchange ideas and discuss current trends whereas they may gain a better understanding of this intricate concept. The Turfgrass Club is to be informal and fun, yet educational and entertaining. The club is open to two-year technical program, Bachelor's degree, and graduate degree students. Club activities include: seminars by leading professionals in the turfgrass industry, field trips, golf tournaments, and fund-raising activities.

For more information, contact John Kaminski (16 Tyson; 865-3007) or visit the website at <http://www.psuturfclub.blogspot.com/>

GCSAA TURF BOWL & STMA STUDENT CHALLENGE

Each year the turfgrass program sends teams of students to the GCSAA Golf Industry Show & Education Conference and to the Sports Turf Managers Association Annual Conference to compete in student competitions. Students compete in groups of four and answer questions on all aspects of turfgrass and turfgrass management. Training for these competitions takes place in the evening in the fall semester prior to the conferences. Professional ag credit is available for students who fully participate in the study sessions, even if they do not make the competition teams and travel to the meetings.

For more information, contact Ben McGraw (243 ASI Bldg; 865-1138) .

AGRONOMY CLUB

The Agronomy Club provides the opportunity for students in Crop Science, Soil Science, and Turfgrass Science majors to participate in various group activities of common interest in a relaxed, informal atmosphere. The club meets biweekly on Thursday evenings where activities are organized, progress discussed, and a program of interest to the group is presented. Programs usually involve invited outside speakers from the alumni; agricultural industries and business; federal, state, and local government; and the educational field to discuss careers and job opportunities. The club is a clearing house for summer jobs, internships, and full-time employment opportunities.

The club sponsors numerous social, educational, and fund raising activities that give all members a chance to assume responsibility and develop their leadership potential. Hayrides, softball games, and other recreational activities such as the annual spring barbecue for the department and friends are occasions for having a good time, developing close friendships, and meeting the faculty on an informal basis. Regular fund raising projects include activities such as the sale of birdseed in the winter and Penn State Agriculture hats and club T-shirts all year round.

It is club tradition to organize a spring and/or fall field trip to visit farms, ag businesses and industries, clubs at other campuses, and places of historical or other interest.

The club is also a member of the student section of the American Society of Agronomy through which various national activities such as the speech, essay writing, and photography contests are yearly events. Participation in these activities is a way to develop an association with students on a national basis, attend a national meeting of the Society of Agronomy, and per chance attain an office or leadership role in the national student organization.

Club membership is a unique opportunity to develop lasting friendships with your colleagues, practice and develop your leadership qualities, and participate in many worthwhile events not available in the formal classroom environment. The club welcomes all of you to become an active member.

For more information, contact Dwight Lingenfelter (425 ASI; 865-2242).

WEED CONTEST TEAM

For those with a special interest in crop production and specifically weeds and their control, as a member of the weed contest team you will have hands on experience calibrating sprayers, identifying weeds and weed seeds, solving grower problems and identifying herbicide injury symptoms. Both graduate and undergraduate teams from universities in Northeastern U.S. and Canada compete with each other in late July or early August. The team is organized at the end of spring semester and they meet in the evening or on weekends on a weekly basis to develop skills in the four contest areas. Team members should have had Agronomy 438 (Principles of Weed Control and Herbicide Properties) in their junior year before participating although anyone with a sincere interest in weed control is welcome.

For more information, contact Dwight Lingenfelter (425 ASI; 865-2242).

RECOGNITION AND AWARDS

Individuals in the department may be recognized for outstanding accomplishments in academics, extracurricular activity, and leadership through awards made on an annual basis by various societies or organizations. In most cases consideration for an award requires documentation by filling out an application and/or having letters of recommendations prepared by your advisor and other people who are familiar with your accomplishments. The majority of the selections for awards are made in the spring semester. A list of those pertinent to Crop and Soil Sciences Department majors follows:

1. American Society of Agronomy - Outstanding Senior Award. Each Agronomy Department in the country is eligible to select and submit a nominee. A plaque is given to the individual to this effect and their picture appears in one of the spring issues of Agronomy News along with the other awardees from around the country.
2. Northeast Section of American Society of Agronomy - Outstanding Senior Award. One senior is selected from nominations made by the various departments. The presentation is made during the annual summer meeting of the Society.
3. Gamma Sigma Delta, an Agricultural Honor Society awards the academically top ranked sophomore, junior, and senior and invites the top ten percent (GPA) of the graduating class in the College of Agricultural Sciences to become members each spring.

4. The Coaly Society awards a College of Agricultural Sciences Outstanding Senior Award based on extracurricular activities, leadership, scholastic performance, and a personal interview. An application obtainable through the Resident Education Office, 101 Ag. Admin., must be submitted to be considered for this award.
5. Alumni Society Internship Award. The College of Agricultural Sciences offers up to 12 \$500 awards to undergraduate students in the College of Agricultural Sciences. A letter, along with an application form and supporting documents, is mailed to the parents of students who have or are participating in an internship.
6. Pennsylvania Turfgrass Council. Graduating seniors are selected based on academic success. The presentation is made by the turf advisors and Pennsylvania Turfgrass Council representatives at a luncheon each semester.
7. Bayer Corporation. One senior is selected in the fall semester based on being the individual with the highest academic success. A presentation is made by a Bayer representative at a luncheon held at the Penn State Golf Turf Conference in November of each year.

PLANT SCIENCE DEPARTMENT SCHOLARSHIPS

Listed below are scholarships awarded through the department. To be considered, you should complete the College of Agricultural Sciences scholarship application form (due in the spring of each year). The application form can be found at <http://agsci.psu.edu/students/scholarships>.

Donor & Stipulations

1. Ag Limestone Standing Committee of PA*
Junior or Senior-must be in the upper 2/5 of the class. Should be a leader as indicated by participation in extracurricular activities. AGESS (integrated crop management option) only.
2. Alan F. Bilzi Scholarship in Environmental Science
Academic focus in Agronomy or Soils and primary interest in career in Environmental Science with superior academic record. AGRO, SOILS/ESOILS, or AGESS majors.
3. Buckwheat Scholarship*+
Applicant must have achieved academic success and demonstrated promise of professional success. AGRO, AGESS, SOILS/ESOILS, or TURF majors.
4. Ethel Gearhart Memorial Scholarship in Agronomy+
Undergraduate and graduate students who are enrolled or planning to enroll in Dept of Agronomy AGRO, AGESS, SOILS/ESOILS, or TURF majors.
5. L. L. Huber Memorial+
Exemplary academic achievement. AGRO, AGESS, SOILS/ESOILS, or TURF majors.
6. L. F. Marriott Memorial*
3rd semester standing or above. 3.00 or higher in courses directly related to major. U.S. citizen who has demonstrated high ethical standards. Must have SOILS, AGESS, or AGRO major and professional interests other than Turfgrass management.
7. W. L. McClellan Memorial*
Interest in studying insect or disease problems in conservation tillage. AGRO or AGESS majors only.
8. PA Forage and Grassland Council*
An interest in forage crop production. AGESS majors only.
9. PA Agronomic Education*+
3rd to 7th semester standing. Consideration based on scholarship, character, and interest in the field. AGRO, AGESS, SOILS/ESOILS, or TURF majors.
10. PA Seedmen's Association+
Junior or senior standing. Shown outstanding ability in agriculture particularly as it relates to the seed industry. AGRO, AGESS, SOILS/ESOILS, or TURF majors.

11. **M. Forest Randolph Memorial**+
AGRO, AGESS, SOILS/ESOILS, or TURF majors who have achieved or manifest promise of academic success.
12. **Harold W. Swartley Scholarship***+
AGECO or TURF majors who have achieved or manifest promise of academic success.
13. **Tim and Amy Baughman Oravec Memorial**
AGECO majors with outstanding service to a crop or applied animal nutrition lab.
14. **Edgar E. and Dorothy W. Fehnel Scholarship**
AGECO majors
15. **George W. Hamilton, Sr. Memorial***+
TURF majors with a USGA Handicap Index of 15 or below

*Documented financial need required

+Available to turfgrass majors