

Michael P. Natrass
Tennessee Tech University
Assistant Professor – Agronomy & Soils
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Professional Positions

Tennessee Technological University - Assistant Professor, Agronomy and Soils (Aug 2020-present)

- Engage undergraduate students through face-to-face classroom and laboratory instruction aimed at developing critical thinking skills and hands-on practical application regarding fundamental concepts essential to successful soil and nutrient management in agricultural production systems
- Create visual materials that showcase agriculture degree programs to increase student recruitment and retention within the School of Agriculture and the College of Agriculture and Human Ecology
- Intra- and interdepartmental faculty collaboration to secure external funding aimed at upholding and improving the reputation of Tennessee Tech University as an institute of higher education and providing service to its community through research that improves the production efficiency of rural agriculture systems and promotes economic stability
- Actively serve on departmental, college, and university committees that serve the Upper Cumberland region of Tennessee

United States Army - Ft. Hood, TX; Ft. Carson, CO. (1997-2001)

Deployment to Bosnia-Herzegovina, March-September 1999

Awards and Medals

Expert Infantryman Badge

Army Commendation Medal

Army Achievement Medal

Army Good Conduct Medal

Army Overseas Service Ribbon

National Defense Service Medal

Army Service Ribbon

Education

Doctor of Philosophy GPA: 3.57 Mississippi State University (Starkville, MS) May 2020 - Plant and Soil Sciences

Dissertation: Evaluation of constructed wetland phytoremediation of selenium-impacted runoff

Master of Science GPA: 3.55 Mississippi State University (Starkville, MS) December 2016 - Agronomy

Thesis: Stabilized urea fertilizer effects on corn nitrogen use efficiency and soil nitrogen transformations

Bachelor of Science GPA: 3.76 Mississippi State University (Starkville, MS) May 2012 - Agricultural Science

Licensures and Certifications

- TN Certified Pesticide Applicator's Certificate, (TN Dept. of Ag), Apr. 2024
- Online Learning Consortium – Online Teaching Certificate (TN Tech University), Dec. 2023
- Preparing Future Faculty Certification, (MS State University), Apr. 2019
- FAA Small UAS Remote Pilot Certification, CFR 107 (Starkville, MS), Apr. 2019
- CITI, Responsible Conduct of Research, (MS State University), Oct. 2016
- Mine Safety and Health Administration Hazard Training, (Red Hills Mine, MS), Aug. 2016

Professional Memberships

Professional Societies

American Society of Agronomy, 2013 – present

Crop Science Society of America, 2013 – present

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Soil Science Society of America, 2013 – present
American Society of Mining and Reclamation, 2017- 2020
Gamma Sigma Delta, 2016-2020

Awards and Honors

Professional

1. 2022 - Outstanding Agriculture Research Award, College of Agriculture and Human Ecology (TN Tech University)
2. 2020 - Outstanding Graduate Research Award (Mississippi Agriculture and Forestry Experiment Station)
3. 2019 - Memorial Scholarship (American Society of Mining and Reclamation)
4. 2019 - Finalist - Graduate Research Assistant of the Year (MS State University)
5. 2019 - 1st place, PhD oral - 83rd Annual MS Academy of Sciences Meeting. Hattiesburg, MS. 21-22 Feb.
6. 2019 - 2nd place, PhD oral - Southern Assoc. of Agric. Scientists. Birmingham, AL. 3-5 Feb.
7. 2018 - Grand Champion - 3-Minute Thesis (MS State University)
8. 2018 - 3rd place, PhD-Oral 35th Meeting American Society of Mining and Reclamation. St. Louis, MO. 3-7 June
9. 2018 - Student Travel Grant (American Society of Mining and Reclamation)
10. 2017 - Future Leaders in Science Award (American Society of Agronomy)
11. 2017 - Finalist - Donald Zacharias Graduate Teaching Assistant of the Year Award (MS State University)
12. 2016 - Finalist - Donald Zacharias Graduate Teaching Assistant of the Year Award (MS State University)

Graduate Students Under My Advisement

1. 2023 - 2nd place, PhD – Oral - Dunn, R.J. Tomato production efficiency in hydroponic systems and impacts on nutrient discharge and profitability. TN Agricultural Production Association. 18-20 Jul.
2. 2023 - 1st place, PhD – Poster - Pierce, K.W., & Nattrass, M.P. 2023. Rapid screening bioassay assessing potential allelopathic influence on spinach by aqueous extract from fresh whole plant sorghum sudangrass tissue. TN Tech Research Symposium. 10 Apr.

Undergraduate Students Under My Advisement

1. 2024 - 2nd place Poster - Bledsoe, A.B., & Nattrass, M.P. Blending stabilized and controlled release fertilizer N for optimizing TN hay production. Southern Assoc. of Agric. Scientists. Atlanta, GA. 3-5 Feb.
2. 2023 - 1st Place Poster - Jones, M.A., Nattrass, M.P., & Bowhay, C.M. The potential for use of wood chips as bioreactors to reduce the amount of nitrogen from agriculture runoff. TN Tech Research Symposium. 10 Apr

Contracts, Fellowships, Grants, and Sponsored Research

In-Review -149, 000

1. 2024 - Modeling nutrient uptake dynamics for predicting discharge and replenishment dynamics in hydroponic tomato production – PI
3-yr funding opportunity
Funding Agency – USDA – Non-Land Grant Colleges of Agriculture

Funded - \$353,878

1. 2023 - Corn yield assessment using low-cost spatial technologies to increase production efficiency and profitability - Co-PI.
1-yr funding opportunity for \$29,920
Funding Agency: Tennessee Corn Promotion Board
2. 2023 - Evaluation of blending stabilized and controlled release fertilizer N for optimizing TN hay production - PI.
Internal award supporting undergraduate research for fertilizer management in hay production.
1-yr funding opportunity for \$5,000
Funding Agency: TN Tech Creative Inquiry Summer Experience
3. 2023 - Integrating virtual reality technologies in the classroom - PI

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Internal award for creating an immersive learning environment through virtual reality.

1-year funding opportunity for \$10,000

Funding Agency: TN Tech Center for Advancing Faculty Excellence

4. 2023 - Assessing agricultural data collection and processing to train machine learning models - PI
Internal award for research aimed collecting and processing data from soil moisture sensors.

1-yr funding opportunity for \$5,000

Funding Agency: Tennessee Tech University Faculty Research Grant

5. 2022 - Unmanned aerial systems for optimizing TN forage production management strategies - PI
Internal award for research aimed at using unmanned aerial systems to estimate biomass and predict forage nutritive value using multispectral imagery.

1-yr funding opportunity for \$5,000

Funding Agency: Tennessee Tech University Faculty Research Grant

6. 2022 - Promoting creative inquiry and critical thinking through developing undergraduate research skills and conducting undergraduate research - Co-PI

1-yr funding opportunity for \$15,138

Funding Agency: Tennessee Tech EDGE Course and Curriculum Grant

7. TBR open educational resources and low costs/no costs educational support materials - Co-PI
“Virtual Lab Activity Vignettes, Agriculture”

Funding opportunity for \$100,000 to TN Tech

Funding Agency: Horticulture Science Foundation

8. 2021 - Soil, Animal, Food, and Economic (SAFE) Research, Education, and Outreach. - Co-PI
Collaborative effort among MTSU, UT-Martin, and Tennessee Tech faculty evaluating best management practices to safeguard soil health and enhance nutritional quality of feed and food commodities.

3-yr funding opportunity for \$150,000 to Tennessee Tech University

Funding Agency: USDA NIFA Capacity Building for Non-Land-Grant Colleges of Agriculture Program

Not Funded – \$1,699,000

9. 2024 - Assessment of smart farm technologies for improving crop production efficiency - PI

1-yr funding opportunity for \$19,000

Funding Agency: Rural Reimagined

10. 2024 - Cost-effective field weed detection system using low-resolution RGB imagery and machine learning – Co-PI

3-yr funding opportunity for \$400,000 (\$200,000 to TN Tech)

Funding Agency: Southern Sustainable Agriculture Research and Education

11. 2023 - Machine learning based decision support system for predicting nutrient concentration in hydroponic tomato discharge solution - PI

Multi-year funding opportunity for \$642,000

Funding Agency: USDA-NIFA

12. 2023 - Establishing an experiment station for conducting smart farm and precision agriculture - PI
Multi-year funding opportunity for \$20,000

Funding Agency: Rural Reimagined

13. 2023 - Soybean yield assessment using low-cost spatial technologies - Co-PI
1-yr funding for \$5,000

Funding Agency: Tennessee Tech Faculty Research Grant

14. 2022 - Cost benefit analysis of fertilizer management strategies in TN corn production - PI
1-yr funding for \$19,000

Funding Agency: Tennessee Corn Promotion Board

15. 2022 - Evaluating prior management effects on soil health - Co-PI
1-yr funding for \$20,000

Funding Agency: Tennessee Tech Faculty Research Grant

16. 2022 - Developing Science Identity in Agriculture Undergraduates through Research - Co-PI
1-yr funding for \$5,000

Funding Agency: Tennessee Tech Faculty Research Grant

17. 2021 - Procuring self-sustainable energy-efficient smart farming infrastructures for economically

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distressed rural communities - Co-PI

1-yr funding for \$100,000 as a planning grant

Funding Agency: National Science Foundation

18. 2021 - Machine learning based decision support system for mixed species hay production using UAS images - Co-PI

3-yr funding for \$450,000 to Tennessee Tech University

Funding Agency: USDA Data Science for Food and Agricultural Systems

Publications (ORCID:0000-0002-0184-6919)

1. Dunn, R.J. & **Nattrass, M.P.** 2024. Response of hydroponic tomato yield and yield-correlated morphological characteristics to constant or growth stage-based nutrient management strategies. *HortScience* 59(10) 1534-1542. <https://doi.org/10.21273/HORTSCI18044-24>
2. **Nattrass, M.P.**, Dhillon, J.S., & Varco, J.J. 2024. Efficacy of fertilizer nitrogen source, stabilizer, and application timing for corn nitrogen nutrition. *Soil Science Society of America Journal* 88(5) 1614-1625 <https://doi.org/10.1002/saj2.20727>
3. Pierce, K.W., & **Nattrass, M.P.** 2023. Rapid bioassay assessing potential allelopathic influence on spinach by aqueous extract from fresh, whole-plant sorghum-sudangrass tissue. *HortScience* 58(10) 1183-1189. <https://doi.org/10.21273/HORTSCI17158-23>
4. **Nattrass, M.P.**, J.I. Morrison, and B.S. Baldwin. 2022. Aqueous selenium removal and distribution in cattail (*Typha angustifolia*) and duckweed (*Lemna minor*) in constructed wetland microcosms. *Agrosystems, Geosciences & Environment.*, (5)1 01 Feb 2022 <https://doi.org/10.1002/agg2.20241>
5. **Nattrass, M.P.**, J.I. Morrison, and B.S. Baldwin. 2020. Influence of temperature and vegetation on selenium removal in constructed wetlands. *Journal of American Society of Mining and Reclamation.* 9(3) 44-71 <http://dx.doi.org/10.21000/JASMR20030044>
6. **Nattrass, M.P.**, N.R. McGrew, J.I. Morrison, B.S. Baldwin. 2019. Phytoremediation of selenium-impacted water by aquatic macrophytes. *J. Am. Soc. Mining and Rec.* 8(1) 69-79 <http://dx.doi.org/10.21000/JASMR19010069>

Professional Presentations

1. **Nattrass, M.P.** 2024. Smart co-ops and decision support systems for small and mid-scale production systems. Southern Association of Agricultural Scientists. Atlanta, GA. 3-5 Feb.
2. **Nattrass, M.P.** 2023. Soil Fertility. Hybrid Food Systems Field Day. Middle Tennessee State. 15 March.
3. **Nattrass, M.P.** 2022. Drone applications in agricultural production systems. UT – Extension (Jackson County) Beef Cattle Field Day. 17 Oct.
4. **Nattrass, M.P.** 2023. Key factors for maintaining soil health. UT - Extension (Putnam County) 13 Feb.
5. **Nattrass, M.P.** 2021. Developing decision support systems for improving rural agricultural production systems. Smart Farm Workshop. IEEE International Conference on Big Data. Atlanta, GA. 10-12 Dec.
6. **Nattrass, M. P.** 2020. Developing smart farm systems for small-scale agricultural production: Opportunities and challenges. Smart Farm Workshop keynote speaker. IEEE International Conference on Big Data. Atlanta, GA. 10-12 Dec.
7. **Nattrass, M.P.**, J.I. Morrison, and B.S. Baldwin. 2019. Seasonal influence on constructed wetland phytoremediation of selenium-impacted runoff. Annual meeting of Am. Soc. of Agron. San Antonio, TX. 9-13 Nov.
8. **Nattrass, M.P.**, J.I. Morrison, and B.S. Baldwin. 2019. Temperature effects on selenium cycling in simulated constructed wetland microcosms. 36th Annual meeting of Am. Soc. of Mining and Rec. Bozeman, MT. 4-6 June.
9. **Nattrass, M.P.**, J.I. Morrison, and B.S. Baldwin. 2019. Seasonal influence on selenium removal in simulated constructed wetlands. 83rd Annual MS Academy of Sciences Meeting. Hattiesburg, MS. 21-22 Feb. ***1st place PhD** oral competition.
10. **Nattrass, M.P.** Phytoremediation: Plants improving water quality. 2019. Three Minute Thesis, Conference of Southeastern Graduate Schools. Knoxville, TN. 15-17 Feb.
11. **Nattrass, M.P.**, J.I. Morrison, and B.S. Baldwin. 2019. Seasonal impact on selenium removal in simulated constructed wetland microcosms. Southern Assoc. of Agric. Scientists. Birmingham, AL. 3-5 Feb. ***2nd place PhD** oral competition.
12. **Nattrass, M.P.** Phytoremediation: Plants improving water quality. 2018. Three Minute Thesis, Mississippi State

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University. 15-16 Nov. ***Grand Champion.**

13. **Nattrass, M.P.**, N.R. McGrew, J.I. Morrison, and B.S. Baldwin. 2018. Phytoremediation of storm water by aquatic macrophytes. 35th Annual meeting Am. Soc. of Mining and Rec. St. Louis, MO. 3-7 June ***3rd place.**
14. **Nattrass, M.P.**, N.R. McGrew, J.I. Morrison, and B.S. Baldwin. 2018. Phytoremediation of selenium- impacted stormwater runoff in constructed wetland microcosms. Southern Assoc. of Agric. Scientists. Jacksonville, FL. 4-6 Feb. ***3rd place** PhD. oral competition.

Graduate Research Presentations/Posters Under My Advisement

1. Dunn, R.J., & Nattrass, M.P. 2024. Response of hydroponic tomato yield-correlated morphology to growth-stage-based nutrient management strategies. TN Tech Research Symposium. 10 Apr Agriculture Division - **Poster**
2. Garner, M.E. 2024. Evaluation of enhanced efficiency fertilizers in TN hay production systems. Southern Assoc. of Agric. Scientists. Atlanta, GA. 3-5 Feb. **Master's Oral.**
3. Dunn, R.J., & Nattrass, M.P. 2023. Tomato production efficiency in hydroponic systems and impacts on nutrient discharge and profitability. TN Agricultural Production Association. 18-20 Jul - ***2nd place** PhD - **Oral**
4. Pierce, K.W., & Nattrass, M.P. 2023. Rapid screening bioassay assessing potential allelopathic influence on spinach by aqueous extract from fresh whole plant sorghum sudangrass tissue. TN Tech Research Symposium. 10 Apr. ***1st place** Agriculture Division – **Poster**
5. Dunn, R.J., & Nattrass, M.P. 2023. Preliminary study of temperature and nutrient concentration effects on seedling emergence and quality. TN Tech Research Symposium. 10 Apr. Agriculture Division - **Poster**

Undergraduate Research Presentations/Posters Under My Advisement

1. Bledsoe, A.B., & **Nattrass, M.P.** 2023. Blending stabilized and controlled release fertilizer N for optimizing TN hay production. Southern Assoc. of Agric. Scientists. Atlanta, GA. 3-5 Feb. ***2nd place** **Poster**
2. Bledsoe, A.B., & **Nattrass, M.P.** 2023. Evaluation of blending stabilized and controlled release fertilizer N for optimizing TN hay production. TN Tech Creative Inquiry Summer Experience. 24 Aug. - **Oral**
3. Beck, G.G., **Nattrass, M.P.**, & Bowhay, C.M. 2023. Can arbuscular mycorrhizal fungi inoculation increase plant biomass? TN Tech Research Symposium. 10 Apr. Agriculture Division - **Poster**
4. Johnson, E., **Nattrass, M.P.**, & Bowhay, C.M. 2023. Potential use of wood chips as a low-cost method to reduce the environmental impact of agricultural runoff. TN Tech Research Symposium. 10 Apr. Agriculture Division - **Poster**
5. Jones, M.A., **Nattrass, M.P.**, & Bowhay, C.M. 2023. The potential for use of wood chips as bioreactors to reduce the amount of nitrogen from agriculture runoff. TN Tech Research Symposium. 10 Apr. **1st place** Agriculture Division - **Poster**
6. Thomas, W.K., **Nattrass, M.P.**, & Bowhay, C.M. 2023. Effects of fertilizer nitrogen stabilizers on N transformations. TN Tech Research Symposium. 10 Apr. Agriculture Division – **Poster**

Research Activity

- Optimizing agricultural production efficiency, enhancing soil health, and improving nutrient management strategies to support sustainable farming.
- Integrate cutting-edge technologies like unmanned aerial systems (UAS) and virtual reality into agricultural practices, aimed at enhancing both classroom learning and practical field applications.
- Secured over \$320,000 in funded research, collaborating with colleagues across departments and institutions to drive innovation. This includes projects funded by agencies such as the Tennessee Corn Promotion Board, USDA-NIFA, and Tennessee Tech University, addressing challenges such as improving corn nitrogen use efficiency, optimizing forage production, and developing machine learning models for agricultural data analysis.

Key Research Areas

Nutrient Management and Fertilizer Efficiency

- Extensively explored nitrogen use efficiency in corn production and blending stabilized fertilizers for hay production
- Presented in numerous high-profile conferences and published in reputable journals, aim to refine nitrogen

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management to enhance crop yields while minimizing environmental impact

Precision Agriculture and Smart Farming

- Research on precision agriculture technologies, such as UAS and smart farm systems, aim to improve data collection, crop monitoring, and decision support systems
- Empower farmers, especially in rural areas, with tools to maximize productivity and profitability

Phytoremediation and Environmental Sustainability

- Early research focused on phytoremediation techniques to manage selenium-impacted runoff using constructed wetlands.
- Improving water quality through natural plant systems

Research Impact

- Published work in peer reviewed journals HortScience and the Soil Science Society of America Journal
- Provided hands-on learning opportunities for both undergraduate and graduate students
- Attended state and regional conferences where students received awards for their oral presentations and posters

Teaching Experience

Course	Title	CR HR	Course	Title	CR HR
AGR 1020	Connections to Agriculture	1	AGRN 3100	Turfgrass Management	3
AGR 3250	Intro to Research I	1	AGRN 3350	Soil & Water Conservation	3
AGR 3275	Intro to Research II	2	AGRN 3400	Crop Pests & Diseases	3
AGRN 1100	Plant Science	3	AGRN 3600	Unmanned Aerial Systems	3
AGRN 2400	Intro to Soils	3	AGRN 4120	Crop Improvement	3
AGRN 2415	Intro to Soils Lab	1	AGRN 4210	Soil Fertility & Fertilizers	3
AGRN 3020	Crop Production	3	AGRN 4220	Environmental Soil Chemistry	3

Teaching Innovation and Curriculum Development

2024 – Developed new Horticulture, Landscape, and Turfgrass Management (HLTMM) concentration

2024 – Developed new Soil & Water Conservation (ASWC) concentration

2023 - Integrating virtual reality technologies in the classroom

2022 - Co-taught AGR 3250 and AGR 3275 courses aimed at creative inquiry and critical thinking through developing undergraduate research skills and conducting undergraduate research

Directed Student Learning

Graduate Committees

1. **Chair, Doctoral** – (Current) Sinkel, N. Use of unmanned aerial vehicles to evaluate the role of native river cane in preserving water quality near cropland in Tennessee.
2. **Chair, Doctoral** – (Current) Dunn, R.J. Optimizing and modeling nutrient use in a drip hydroponic system for tomato production.
3. Member, Doctoral (Nov 2023) – Duwadi, S. Factors effecting nutrient recovery and greenhouse gas emissions in restored agricultural floodplain wetlands.
4. **Chair, Doctoral** – (May 2023) Pierce, K.W. A rapid-screening bioassay for predicting allelopathic interactions between cultivars of *Spinacia oleracea* L. and cultivars of *Sorghum bicolor* (L.) Moench.
5. Member, Doctoral. (June 2023) Mahan, M. Multiple assessments of critical thinking by introducing a case study.
6. Member, Doctoral (July 2023) – Koehler, E. Insect resistance and horticultural traits of acylsugar tomato breeding lines.

Service Activities – Internal/External

TN Tech University

- Member - Faculty Senate (2023-present)
 - Administrative Council
- Member - Environmental Sciences Graduate Curriculum Committee (2021-present)
- Member - Stormwater Committee (2021-present)

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TN Tech College of Agriculture and Human Ecology

- Member - Director Search Committee (2024)
- Member - Director Search Committee (2022)
- Member - Events Committee (2020-2021)
- Member - Recruitment Committee (2020-2021)

TN Tech School of Agriculture

- **Chair** - Ag Business Search Committee (2024)
- Representative - Agriculture Foundation (2023-present)
- Member - Ag Business Search Committee (2022)
- Member - Animal Science Cluster Hire Committee (2021)
- Member - Events Committee (2020-2021)
- Member - Recruitment Committee (2020-2021)