

# Nicholas Ace Pugh, Ph.D.

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## EMPLOYMENT

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2021	–	Present	Postdoctoral Research Geneticist, Crop Systems Research Laboratory, United States Department of Agriculture – Agricultural Research Service, Lubbock, TX
2019	–	2021	Postdoctoral Research Associate, Pauli Laboratory, School of Plant Sciences, University of Arizona, Tucson, AZ

## EDUCATION

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2018	Ph.D.	Texas A&M University, College Station, TX. Plant Breeding. Advisor – William L. Rooney, Regents Professor Dissertation Title: “Evaluation and Implementation of Proximal and Remote Sensing Techniques in a Sorghum Breeding Program”
2015	M.S.	Texas A&M University, College Station, TX. Plant Breeding. Advisor – William L. Rooney, Regents Professor Thesis Title: “Heritability and Quantitative Trait Loci for Popping Quality Characteristics in Sorghum Grain”
2012	B.S.	University of Central Oklahoma, Edmond, OK. Biology.

## PUBLICATIONS

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### Peer-Reviewed Publications (Reverse Chronological Order)

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16. **Pugh, N. A.**, Thorp, K. R., Gonzalez, E. M., Elshikha, D. E. M., & Pauli, D. (2021). Comparison of image georeferencing strategies for agricultural applications of small unoccupied aircraft systems. *The Plant Phenome Journal*, 4(1), e20026.
15. Xin, Z., Wang, M., Cuevas, H. E., Chen, J., Harrison, M., **Pugh, N.**, & Morris, G. (2021). Sorghum genetic, genomic, and breeding resources. *Planta*, 254(6), 1-24.
14. Deng, X., Thomasson, J. A., **Pugh, N. A.**, Chen, J., Rooney, W. L., Brewer, M. J., & Shi, Y. (2020). Estimating the severity of sugarcane aphids infestation on sorghum with machine vision. *International Journal of Precision Agricultural Aviation*, 3(2). DOI: 10.33440/j.ijpaa.20200302.89
13. Hodnett, G. L., Ohadi, S., **Pugh, N. A.**, Bagavathiannan, M. V., & Rooney, W. L. (2019). Sorghum bicolor x S. halapense interspecific hybridization is influenced by the frequency of 2n gametes in S. bicolor. *Scientific Reports*, DOI: <https://doi.org/10.1038/s41598-019-53193-3>

12. Nelson, A. D. L., Ponciano, G., McMahan, C., Ilut, D. C., **Pugh, N. A.**, El-shikha, D. E., Hunsaker, D. J., Pauli, D (2019). Transcriptomic and evolutionary analysis of the mechanisms by which *P. argentatum*, a rubber producing perennial, responds to drought. *BMC Plant Biology*, DOI: <https://doi.org/10.1186/s12870-019-2106-2>
11. **Pugh, N. A.**, Morgan, C. L. S., Horn, K., Pietsch, D., & Rooney, W. L. (2019). A statistical evaluation of replicated block designs and spatial variability in sorghum performance trials. *Journal of Crop Improvement*, DOI: <https://doi.org/10.1080/15427528.2019.1627686>
10. Malambo, L., Popescu, S. C., Horne, D.W., **Pugh, N. A.**, & Rooney, W. L. (2019). Automatic detection and characterization of individual sorghum panicles from terrestrial LiDAR data. *ISPRS Journal of Photogrammetry and Remote Sensing*, DOI: <https://doi.org/10.1016/j.isprs.2018.12.015>
9. Patil, N. Y., **Pugh, N. A.**, Klein, R. R., Martinez, H. S., Martinez, R. S., Rodriguez-Herrera, R., Rooney, W. L., & Klein, P.E. (2019). Heritability and quantitative trait loci of composition and structural characteristics in sorghum grain. *Journal of Crop Improvement*, DOI:10.1080/15427528.2018.1536006
8. Han, X., Thomasson, A. J., Bagnall, G. C., **Pugh, N. A.**, Horne, D. W., Rooney, W. L., Jung, J., Chang, A., Malambo, L., Popescu, S. C., Gates, I. T., & Cope, D. A. (2018). Measurement and calibration of plant-height from fixed-wing UAV images. *Sensors*, DOI: <https://doi.org/10.3390/s18124092>
7. **Pugh, N. A.**, Han, X., Collins, S. D., Thomasson, J. A., Cope, D., Chang, A., Jung, J., Isakeit, T. S., Prom, L. K., Carvalho, G., Gates, I. T., Vree, A., Bagnall, G. C., & Rooney, W. L. (2018). Estimation of Plant Health in a Sorghum Field Infected with Anthracnose Using a Fixed-Wing Unmanned Aerial System. *Journal of Crop Improvement*, DOI: 10.1080/15427528.2018.1535462
6. **Pugh, N. A.**, Horne, D. W., Murray, S. C., Carvalho, G., Malambo, L., Jung, J., Chang, A., Maeda, M., Popescu, S., Chu, T., Starek, M. J., Brewer, M. J., Richardson, G., & Rooney, W. L. (2018). Temporal Estimates of crop growth in sorghum and maize breeding enabled by unmanned aerial systems. *The Plant Phenome*, DOI: 10.2135/tppj2017.08.0006
5. Malambo, L., Popescu, S. C., Murray, S. C., Putman, E., **Pugh, N. A.**, Horne, D. W., Richardson, G., Sheridan, R., Rooney, W. L., Avant, R., Vidrine, M., McCutchen, B., Baltensperger, D., & Bishop, M. (2018). Multitemporal field-based plant height estimation using 3D point clouds generated from small unmanned aerial systems high-resolution imagery. *International Journal of Applied Earth Observation and Geoinformation*, 64, 31-42. DOI:<https://doi.org/10.1016/j.jag.2017.08.014>
4. **Pugh, N. A.**, Rodriguez-Herrera, R., Klein, R. R., Klein, P. E., & Rooney, W. L. (2017). Identification of Quantitative Trait Loci for Popping Traits and Kernel Characteristics in Sorghum Grain. *Crop Science*, 57(4), 1999-2006. DOI: 10.2135/cropsci2017.01.0029
3. **Pugh, N. A.**, Awika, J. M., & Rooney, W. L. (2017). Heritability of popping characteristics in sorghum grain. *Crop Science*, 57(1), 71-77. DOI: 10.2135/cropsci2016.04.0250
2. Shi, Y., Thomasson, J. A., Murray, S. C., **Pugh, N. A.**, Rooney, W. L., Shafian, S., Rajan, N., Rouze, G., Morgan, C. L. S., Neely, H. L., Rana, A., Bagavathiannan, M. V., Henrickson, J., Bowden, E., Valasek, J., Olsenholler, J., Bishop, M. P., Sheridan, R., Putman, E. B., Popescu, S., Burks, T., Cope, D., Ibrahim, A., McCutchen, B. F., Baltensperger, D. D., Avant, R. V., Vidrine, M., & Yang, C. (2016). Unmanned aerial vehicles for high-throughput phenotyping and agronomic research. *PLoS one*, 11(7), e0159781. DOI: <https://doi.org/10.1371/journal.pone.0159781>
1. Brennan Jr, R. E., Caire, W., **Pugh, N. A.**, Chapman, S., Robbins, A. H., & Akiyoshi, D. E. (2015). Examination of bats in western Oklahoma for antibodies against *Pseudogymnoascus*

destructans, the causative agent of White-Nose Syndrome. *The Southwestern Naturalist*, 60(2-3), 145-150. DOI: <https://doi.org/10.1894/SWNAT-D-14-00030.1>

### **Conference Proceedings (Reverse Chronological Order)**

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2. Han, X., Thomasson, J. A., Bagnall, C., **Pugh, N. A.**, Horne, D. W., Rooney, W. L., Malambo, L., Chang, A., Jung, J., & Cope, D. A. (2018). Calibrated plant height estimates with structure from motion from fixed-wing UAV images. In *Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping III* (Vol. 10664, p. 106640D). International Society for Optics and Photonics. DOI: <https://doi.org/10.1117/12.2305746>
1. Shi, Y., Murray, S. C., Rooney, W. L., Valasek, J., Olsenholler, J., **Pugh, N. A.**, Henrickson, J., Bowden, E., Zhang, D., & Thomasson, J. A. (2016). Corn and sorghum phenotyping using a fixed-wing UAV-based remote sensing system. In *Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping* (Vol. 9866, p. 98660E). International Society for Optics and Photonics. DOI: <https://doi.org/10.1117/12.2228737>

### **PROFESSIONAL ACTIVITIES AND PRESENTATIONS**

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#### **Platform Presentations**

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- 2022 Sorghum Improvement Conference of North America (Invited Speaker); “Optimal Georeferencing of Aerial Photogrammetry Projects”
- 2020 Arizona Postdoctoral Research Conference in AZ (Remote); “Optimal Georeferencing of Aerial Photogrammetry Projects”
- 2020 Phenome Conference held at University of Arizona in Tucson, AZ: “Georeferencing of Aerial Photogrammetry via Ground Control Point Optimization and Real-time Kinematic Positioning in Agricultural Fields at Breeding and Production Scale”
- 2018 Invited Presentation at the ‘Sorghum in the 21<sup>st</sup> Century’ Conference in Cape Town, WC, South Africa; “Validation and Implementation of Unmanned Aerial Systems in a Sorghum Breeding Program”
- 2018 Invited Poster Presentation at the Washington State University Plant Science Symposium in Pullman, WA; “Temporal Estimates of Crop Growth in Sorghum and Maize Breeding Enabled by Unmanned Aerial Systems”
- 2018 Seminar Presentation at Texas A&M University in College Station, TX; “Temporal Estimates of Crop Growth in Sorghum and Maize Breeding Enabled by Unmanned Aerial Systems”
- 2018 Student Speaker Award – Oral Flash Presentation at the Texas A&M Plant Breeding Symposium in College Station, TX; “Temporal Estimates of Crop Growth in Sorghum and Maize Breeding Enabled by Unmanned Aerial Systems”
- 2018 Webinar Presentation for the Plant Phenome Journal Webinar Series; “Temporal Estimates of Crop Growth in Sorghum and Maize Breeding Enabled by Unmanned Aerial Systems”
- 2017 Tri-society Oral Presentation in Tampa, FL; “Estimation of Biomass Yield and Plant Height in Bioenergy Sorghum Using Unmanned Aerial Systems”
- 2017 Invited Presentation at the University of Minnesota Plant Sciences Symposium; “Estimation of Plant Height in Sorghum Using Unmanned Aerial Systems”
- 2016 Keynote Presentation at the Texas A&M University Plant Breeding Symposium, College Station, TX; “Heritability and Quantitative Trait Loci for Popping Characteristics in Sorghum Grain”

2014 Presentation at the Sorghum Improvement Conference of North America in Corpus Christi, TX; “Heritability and Quantitative Trait Loci for Popping Characteristics in Sorghum Grain”

2014 Seminar Presentation at Texas A&M University in College Station, TX; “Heritability and Quantitative Trait Loci for Popping Characteristics in Sorghum Grain”

### **Poster Presentations**

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2020 Phenome Conference held at University of Arizona in Tucson, AZ; “Georeferencing of aerial photogrammetry via ground control point optimization and real-time kinematic positioning in agricultural fields at breeding and production scale”

2018 Texas A&M Plant Breeding Symposium in College Station, TX; “Temporal Estimates of Crop Growth in Sorghum and Maize Breeding Enabled by Unmanned Aerial Systems”

2017 Texas Plant Protection Conference in College Station, TX; “Estimation of Disease Presence and Severity in Sorghum Using Unmanned Aerial Systems”

2017 Texas A&M Plant Breeding Symposium in College Station, TX; “Heritability and Quantitative Trait Loci for Popping Characteristics in Sorghum Grain”

2015 Tri-society Meeting in Minneapolis, MN; “Heritability and Quantitative Trait Loci for Popping Characteristics in Sorghum Grain”

2015 Texas A&M Plant Breeding Symposium in College Station, TX; “Heritability and Quantitative Trait Loci for Popping Characteristics in Sorghum Grain”

2014 Texas A&M Horticulture Symposium in College Station, TX; “Heritability and Quantitative Trait Loci for Popping Characteristics in Sorghum Grain”

### **AFFILIATIONS/ASSOCIATIONS/MEMBERSHIPS**

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National Postdoctoral Association	Affiliate Member (2019 – Present)
National Association of Plant Breeders	Member (2013 – Present)
Crop Science Society of America	Member (2013 – Present)
American Society of Agronomy	Member (2013 – Present)
Soil and Crop Sciences Dept. Climate Committee	Student Member (2017)
Soil Science Society of America	Member (2013 – Present)

### **HONORS AND AWARDS**

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2019 Yuma Center of Excellence for Desert Agriculture (YCEDA) Seed Funding Program Grant for \$10,000 USD

2018 Special Achievement Award for Graduate Student Research in Plant Breeding – Texas A&M Dept. of Soil and Crop Sciences

2018 USDA/NIFA Participant Support and Travel Scholarship to Cape Town, WC, South Africa

2018 Student Travel Award – Washington State University Plant Science Symposium

2018 Oral Presentation Award – Texas A&M Plant Breeding Symposium  
2017 Invited Speaker – University of Minnesota Plant Sciences Symposia  
2016 Keynote Oral Presentation – Texas A&M University Plant Breeding Symposium  
2014 Student Oral Presentations (3<sup>rd</sup> Place) – Sorghum Improvement Conference of North America  
2011 Research Experience for Undergraduates – Texas A&M University Dept. of Biochemistry  
2011 Student Research, Creative, and Scholarly Activities (RCSA) Grant

## TEACHING

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### Undergraduate Students Mentored

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2017 Hector S. Martinez  
2016 Zachary Dickson

### Courses Taught (As Teaching Assistant)

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2016 Crop Biology and Physiology (SCSC 307)  
2014 World Food and Fiber Crops (SCSC 105)  
2012, 2013 Genetics (GENE 312)  
2010, 2011 Biology (BIO 1211)

### Courses Taught (As Guest Lecturer)

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2019 Plant Breeding and Genetics (PLS 415)

## OUTREACH

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Crop Science Society of America; “Popping potential of sorghum” by Danielle St. Louis (<https://www.crops.org/science-news/popping-potential-sorghum>)

AgriLife Today, Texas A&M University; “Popped Sorghum Making its Way onto Snack Scene” by Kay Ledbetter (<http://today.tamu.edu/2016/03/07/popped-sorghum-making-its-way-onto-snack-scene/>)

## REFERENCES

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Duke Pauli	Assistant Professor School of Plant Sciences University of Arizona	email: dukepauli@email.arizona.edu phone: (520) 621-3656
Zhanguo Xin	Research Molecular Biologist Crop Stress Research Laboratory USDA-ARS	email: zhanguo.xin@usda.gov phone: (806) 749-5560 ext. 5223
William L. Rooney	Regents Professor Department of Soil and Crop Sciences Texas A&M University	email: wlr@tamu.edu phone: (979) 845-2151
Cristine L. S. Morgan	Chief Scientific Officer Soil Health Institute	email: cmorgan@soilhealthinstitute.org phone: (979) 676-3508

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