

Dr. Richard J. Heerema
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Education

- Ph.D. Plant Biology. University of California, Sept. 2005. Dissertation: “Compartmentalization of carbon and nitrogen stresses within almond spurs”. Advisors: Drs. Theodore M. DeJong and Steven A. Weinbaum
- B.A. Biology and Agriculture: Plant Science (double major), Dordt College, Sioux Center, IA, May 1998.

Horticulture Extension and Research Experience

- Assistant Head for Extension Plant Sciences Department, New Mexico State University, Aug. 2018-Present. Provide regular support for the Head for the Extension Plant Sciences Department in daily administration of the department.
- Extension Pecan and Pistachio Specialist, New Mexico State University, Oct. 2005-Present. Currently developing a research program investigating production issues faced by New Mexico pecan growers, particularly issues surrounding alternate bearing, fertilizer usage and irrigation. Responsibilities include relaying research to New Mexico tree nut growers and directly assisting orchardists with production related problems. Coordinated Western Pecan Growers Association Conference educational program annually 2006-2019. Coordinated Western Pecan Production Short Course 2010, 2012, 2014, 2016, and 2018. Tenured and promoted to rank of Associate Professor July 2011. Promoted to rank of Professor July 2017.
- Doctoral Research, University of California, Davis, Oct. 2000-Sept. 2005. Tested the “branch autonomy” hypothesis as it relates to almond spur carbohydrate storage, flowering, mortality and fruit set. Assessed the possibility of improving the sensitivity of diagnosis of N deficiencies in almond by sampling leaves from fruiting spurs, rather than non-fruiting spurs as prescribed by the current recommendations.
- Research Assistant, Dry Creek Laboratories, Hughson, CA, 1998-2000. Introduced new fruit and nut cultivars and rootstocks to tissue culture. Performed genetic transformation of apple.

Peer-Reviewed Publications

- H. Shadgou-Rhein, A. Sreedasyam, P. Cooke, C Velasco-Cruz, J. Grimwood, J. Schmutz, J. Jenkins, S. Kumar, M. Song, **R.J. Heerema**, L.J. Grauke, and J.J. Randall, 2023. Comparative transcriptome analyses reveal insights into catkin patterns in pecan protogynous and protandrous cultivars. PLOS One (Accepted)

- J.B. Wood, C.S. Cramer, R.Steiner, **R. Heerema**, B.J.Schutte, and I. Guzman, 2023. Onions selected for reduced symptom expression of Iris Yellow Spot have higher photosynthesis rates. Hortscience 58(3): 254-258
- K. Cervantes, **R.J. Heerema**, and J.J. Randall, 2022. The core microbiome of *Carya illinoensis* (pecan) seedlings of different maternal pecan cultivars from the same orchard. Frontiers in Microbiomes 1: 1003112
- C. A. Smith, D. VanLeeuwen, **R.J. Heerema**, J. D. Sherman, M. J. Comeau, and J. L. Walworth. 2022. Zinc variability in pecan orchards: Implications for leaf sampling and nutrient recommendations. HortScience, 57(4), 550-557
- K. Cervantes, A. Hilton, R. Stamler, **R.J. Heerema**, C. Bock, X. Wang, Y.K. Jo, L.J. Grauke, and J. J. Randall. 2022. Evidence for seed transmission of *Xylella fastidiosa* in pecan (*Carya illinoensis*). Frontiers of Biology, 13, 780335
- E. Mokari, Z. A. Samani, **R.J. Heerema**, E. Dehghan Niri, D.W. Dubois, , F.A. Ward, and C. Pierce. 2022. Development of a new UAV-thermal imaging based model for estimating pecan evapotranspiration. To appear in Computers and Electronics in Agriculture, 194, 106752
- E. Creegan, R.P. Flynn, G. Torell, C.E. Brewer, D. VanLeeuwen, R. Acharya, **R.J. Heerema**, and M.K. Darapuneni. 2022. Pecan (*Carya illinoensis*) and dairy waste stream utilization: properties and economics of on-farm windrow systems. Sustainability, 14(5), 2550
- C.A. Smith, J.L. Walworth, M.J. Comeau, **R.J. Heerema**, J.D. Sherman, and R. Norton. 2021. Impacts of maternal genotype on pecan seedling performance in an alkaline, saline-sodic soil. HortScience 56(9): 1015-1022
- J. T. Lovell, N. B. Bentley, G. Bhattarai, J. W. Jenkins, A. Sreedasyam, Y. Alarcon, C. Bock, L. Boston, J. Carlson, K. Cervantes, K. Clermont, N. Krom, K. Kubenka, S. Mamidi, C. P. Mattison, M. J. Monteros, C. Pisani, C. Plott, S. Rajasekar, H. Shadgou Rhein, C. Rohla, M. Song, R. St. Hilaire, S. Shu, L. Wells, J. Webber, **R. Heerema**, P. E. Klein, P. Conner, X. Wang, L.J. Grauke, J. Grimwood, J. Schmutz, and J. J. Randall. 2021. Four chromosome scale genomes and a pan-genome annotation to accelerate pecan tree breeding. Nature Communications 12: 4125.
- M.Y. Thompson*, J.J. Randall, D. VanLeeuwen, and **R.J. Heerema**. 2021. Differential expression of key floral initiation genes in response to plant growth regulator application and alternate bearing in pecan, Journal of the American Society for Horticultural Science 146 (3): 206-214
- C.A. Smith, J.L. Walworth, M.J. Comeau, **R.J. Heerema**, and J.D. Sherman. 2021. Does foliar zinc application boost leaf photosynthesis of ‘Wichita’ pecan fertigated with zinc-EDTA? HortScience 56(5): 579-582
- E. Mokari, Z. Samani, **R. Heerema**, and F. Ward. 2021. Evaluation of long-term climate change impact on the growing season and water use of mature pecan in Lower Rio Grande Valley. Agricultural Water Management 252: 106893.
- Y. Wang*, **R.J. Heerema**, J.L. Walworth, B. Dungan, D. VanLeeuwen, and F.O. Holguin. 2020. Nutraceutical properties of pecan kernels are affected by soil zinc fertilizer application. HortScience 55(12): 2001-2007, <https://doi.org/10.21273/HORTSCI15314-20>
- Y. Gong, R.B. Pegg, A.L. Kerrihard, B.E. Lewis, and **R.J. Heerema**. 2020. Pecan kernel phenolics content and antioxidant capacity are enhanced by mechanical

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pruning and higher fruit position in the tree canopy. *Journal of the American Society for Horticultural Science*, 145(3): 193-202

- M. Khezri, **R. Heerema**, G. Brar, and L. Ferguson. 2020. Alternate bearing in pistachio (*Pistacia vera* L.): A review. *Trees—Structure and Function* 34: 855-868
- S.A. Moran-Duran*, R.P. Flynn, **R.J. Heerema**, and D. VanLeeuwen. 2020. Leaf net photosynthesis, leaf greenness, and shoot lignin content of nonbearing pecan trees at two nitrogen and nickel application rates. *HortScience* 55(2): 231-236
- M.Y. Thompson*, J. Randall, **R.J. Heerema**, and D. VanLeeuwen. Exogenous plant growth regulators show promise for management of alternate bearing in pecan. 2019. *HortScience* 54(7): 1204-1207
- J. J. Randall, R. A. Stamler, C. E. Kallsen, E. J. Fichtner, **R. Heerema**, P. Cooke, and I. Francis. 2018. Comment on "Evolutionary transitions between beneficial and phytopathogenic *Rhodococcus* challenge disease management". *eLife*, 7. elifesciences.org/articles/35272
- A.E. Hilton, Y.K. Jo, R.A. Stamler, J.M. French, **R.J. Heerema**, N.P. Goldberg, J. Sherman, X. Wang, J.J. Randall, and L.J. Grauke. 2017. First report of *Xylella fastidiosa* in *Carya illinoensis* in Arizona, New Mexico, California, and Texas. *Plant Disease*, 101(11): 1949
- J.D. Sherman*, D. VanLeeuwen, R. St. Hilaire, and **R.J. Heerema**. 2017. Optimum manganese nutrition improves photosynthesis of immature pecan trees grown in the Mesilla Valley, New Mexico. *HortScience* 52 (4): 634-640
- J.L. Walworth, S.A. White, M.J. Comeau, and **R.J. Heerema**. 2017. Soil-applied Zn-EDTA: Vegetative growth, nut production, and nutrient acquisition of immature pecan grown in an alkaline, calcareous soil. *HortScience* 52(2): 301-305
- **R.J. Heerema**, D. VanLeeuwen, M.Y. Thompson, J.D. Sherman, M.J. Comeau, and J.L. Walworth. 2017. Leaf photosynthesis of immature ‘Wichita’ is increased by soil-application of zinc-EDTA. *Journal of the American Society for Horticultural Science* 142(1): 27-35
- R.A. Stamler, **R.J. Heerema**, and J.J. Randall. 2015. First report of *Rhodococcus* isolates causing Pistachio Bushy Top Syndrome on ‘UCB-1’ rootstock in New Mexico. *Plant Disease*, 99: 1854.
- R.A. Stamler, J. Kilcrease, C. Kallsen, E. J. Fichtner, P. Cooke, **R.J. Heerema**, and J.J. Randall. 2015. First Report of *Rhodococcus fascians* causing Pistachio Bushy Top Syndrome on ‘UCB-1’ rootstock in California and Arizona. *Plant Disease*, 99: 1468-1476
- Y. Othman, D. VanLeeuwen, **R. Heerema**, and R. St Hilaire. 2014. Midday stem water potential values needed to maintain leaf gas exchange and photosynthesis established for pecans. *Journal of the American Society for Horticultural Science*, 139(5): 537-546
- **R.J. Heerema**, D. VanLeeuwen, R. St. Hilaire, V.P. Gutschick, and B. Cook. 2014. Leaf photosynthesis in nitrogen-starved ‘Western’ pecan is lower on fruiting shoots than non-fruiting shoots during kernel fill. *Journal of the American Society for Horticultural Science*, 139(3): 267-274
- J.M. Lillywhite, J.E. Simonsen, and **R.J. Heerema**. 2014. US consumer purchases and nutritional knowledge of pecans. *HortTechnology*, 24(2): 222-230

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- Y. Othman, C.M. Steele, D. VanLeeuwen, **R. Heerema**, A.S. Bawazir, and R. St. Hilaire. 2014. Remote sensing used to detect moisture status of pecan orchards grown in a desert environment. *International Journal of Remote Sensing*, 35(3): 949-966
- M. Mohseni-Moghadam, J. Schroeder, **R. Heerema**, and J. Ashigh, , 2013. Resistance to Glyphosate in *Amaranthus palmeri* Populations from New Mexico. *Weed Technology*, 27: 85-91
- M. T. Potter*, **R.J. Heerema**, J. Schroeder, J. Ashigh, D. VanLeeuwen, and C. Fiore. 2012. Mature Pecan Orchard Floor Vegetation Management in Southern New Mexico: Impacts on Tree Water Status, Nutrient Content and Nut Production. *HortScience*, 47 (6), 727-732
- T.M. Spann and **R.J. Heerema**. 2010. A simple method for nondestructive estimation of whole shoot leaf area in tree fruit crops. *Scientia Horticulturae*, 125(3): 528-533.
- B.W. Wood, L. Lombardini and **R.J. Heerema**. 2009. Influence of aminoethoxyvinylglycine on pecan fruit retention. *HortScience*, 44: 1884-1889.
- J.M. French, **R.J. Heerema**, E.A. Gordon, and N.P. Goldberg, 2009. First Report of Septoria Leaf Spot of Pistachio in New Mexico. *Plant Disease*, 93: 762
- **R.J. Heerema**, S.A. Weinbaum, B.D. Lampinen and T.M. DeJong. 2009. Is nitrogen stress more apparent in shaded and fruiting almond spur sub-populations than exposed, non-fruiting sub-populations? *Journal of Horticultural Science and Biotechnology*, 84: 355-359
- J.C. Kallestad, J.G. Mexal, T.W. Sammis and **R.J. Heerema**. 2008. Development of a simple irrigation scheduling calendar for Mesilla Valley pecan growers. *HortTechnology*, 18(4): 714-725
- **R.J. Heerema**, S.A. Weinbaum, F. Pernice and T.M. DeJong. 2008. Spur survival and return bloom in almond [*Prunus dulcis* (Mill.) D.A. Webb] varied with spur fruit load, specific leaf weight, and leaf area. *Journal of Horticultural Science and Biotechnology*, 83(2): 274-281
- E.J. Reidel, P.H. Brown, R.A. Duncan, **R.J. Heerema**, and S.A. Weinbaum. 2004. Sensitivity of yield determinants to potassium deficiency in ‘Nonpareil’ almond (*Prunus dulcis* (Mill.) D.A. Webb). *Journal of Horticultural Science and Biotechnology*, 79 (6), 906-910
- V.S. Polito, K. Pinney, **R. Heerema**, and S.A. Weinbaum. 2002. Flower differentiation and spur leaf area in almond. *Journal of Horticultural Science and Biotechnology*, 77 (4), 474-478

Publications—Extension Guides, Circulars, and Bulletins

- **R.J. Heerema**. 2021. Pecan Cultivars for New Mexico. Extension Guide H-659 (https://aces.nmsu.edu/pubs/_h/H659.pdf)
- J. Walworth and **R. Heerema**. 2019. Zinc management in Arizona and New Mexico pecan orchards. University of Arizona Extension Guide 1789 (<https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1789-2019.pdf>).

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- **R. Heerema**, R. Garzon, and J. Hartley. 2018. Pecans: A healthful New Mexico-grown food. NMSU Extension Guide E-138 (https://aces.nmsu.edu/pubs/_e/E138.pdf).
- D. Blayney, **R. Heerema**, and P.H. Gutierrez. 2017. Pecan prices and grades. NMSU Extension Guide Z-502 (http://aces.nmsu.edu/pubs/_z/Z502.pdf).
- C. Sutherland, J. Breen Pierce, B. Lewis, and **R. Heerema**. 2017. Pecan weevil: Wanted dead, not alive. NMSU Extension Circular 683 (http://aces.nmsu.edu/pubs/_circulars/CR683.pdf).
- S. Hanson, L. Beck, N. Flores, S. Walker, M. Marsalis, and **R. Heerema**. 2017. GMO crops in New Mexico agriculture. NMSU Extension Circular 682 (http://aces.nmsu.edu/pubs/_circulars/CR682.pdf).
- **R. Heerema**. 2015. Training young pecan trees. NMSU Extension Guide H-605 (http://aces.nmsu.edu/pubs/_h/H605.pdf).
- S. Yao and **R. Heerema**. 2014. Fruits and nuts for New Mexico orchards. NMSU Extension Guide H-310 (http://aces.nmsu.edu/pubs/_h/H310.pdf).
- **R. Heerema**, 2013. Diagnosing nutrient disorders of New Mexico pecans. NMSU Extension Guide H-658 (http://aces.nmsu.edu/pubs/_h/H658.pdf).
- **R. Heerema**, 2011. Irrigation scheduling of pecan orchards: Soil moisture monitoring, NMSU Guide H-640 (http://aces.nmsu.edu/pubs/_h/H640.pdf).
- J. M. Lillywhite, **R. Heerema**, J.E. Simonsen, and E. Herrera, 2010. Pecan Marketing Channels in New Mexico, NMSU Extension Guide Z-307.
- **R. Heerema**, N. Goldberg and S. Thomas, 2010. Diseases and other disorders of pecan in New Mexico, NMSU Extension Guide H-657.
- **R. Heerema** and J. White, 2008. Transplanting mature pecan trees in New Mexico, NMSU Extension Guide H-655.
- **R. Heerema**, J. Mexal and T. Sammis, 2008. Irrigation scheduling of pecan orchards: The water budget approach, NMSU Water Task Force Report 8.
- J. Lillywhite, **R. Heerema**, J. White and J. Simonsen, 2008. Marketing structure options for NM pecan growers, NMSU Extension Guide Z-308.
- **R. Heerema**, J. Libbin and J. White, 2007. Producing and Marketing Organic Pecans in New Mexico, NMSU Extension Circular 632.
- **R. Heerema**, W. Eastman and B. Jacobs, 2007. Pecans: A healthful New Mexico grown food, NMSU Extension Guide E-138.

Publications—Selected Recent Popular and Trade Magazines Articles

- ‘Pecan Orchard Tasks’ column in The Pacific Nut Producer Magazine (a popular trade magazine dedicated to issues of nut producers across the western US); 2006-present.
- ‘The Western Front’ column in Pecan South magazine (a popular trade magazine published by the Texas Pecan Growers Association that covers the nationwide pecan industry).

Recent Presentations Before Professional Societies—Posters

- J.J. Randall (presenter), C. Velasco-Cruz, N. Pietrasiak, and **R. Heerema**. The bacterial microbiome of New Mexico pecan roots and rhizospheres, Plant and Animal Genome Conference, San Diego, CA, January 13-18, 2023
- T. Kamal Shamma, R. Heerema, and A. Fernald. Understanding the significance of deep percolation component in the water budget of a drip irrigated pistachio field, New Mexico Water Conference, Las Cruces, NM, October 27, 2022
- **R.J. Heerema** (Presenter), Nicole Pietrasiak, Jennifer Randall, Andrew Dominguez, and Ciro Velasco-Cruz. Revealing the New Mexico pecan root-soil microbiome to improve plant health and productivity, International Horticultural Congress, Angers, France, August 18, 2022
- C. Pierce (Presenter)*, **R. Heerema**, and B. Stringam, Assessing water use efficiency in field-grown pecans under a partial root zone drying irrigation regime, American Society for Horticultural Science Annual Conference, Las Vegas, NV, July 25, 2019
- K. Lowe, H. Shadgou-Rhein, J.J. Randall, **R. Heerema**, and R. St Hilaire (Presenter), Molecular approaches to decipher alternate bearing in pecans, American Society for Horticultural Science Annual Conference, Las Vegas, NV, July 25, 2019
- H. Shadgou Rhein, **R. Heerema**, J.J. Randall, Unmasking the mysteries of catkin floral initiation in *Carya illinoensis* through RNA-seq analysis, American Society of Plant Biologists, San Jose, CA, August 2019
- French J.* , R. Flynn, and **R. Heerema** (presenter). Pecan rootstock genotype effects on micronutrient uptake in alkaline, calcareous soils. Reno, NV, March 7-8, 2019.
- Pierce, C.* (presenter), B. Stringam, and **R. Heerema**, Feasibility of a partial root zone drying irrigation regime in field grown pecans, International Conference on Irrigation and Drainage, Phoenix, AZ, October 17, 2018
- D. K. Ray (presenter), J. J. Randall, L. Sanchez, J. R., Soneji, and **R.J. Heerema**. Evaluating the efficacy of nickel fertilization on micropropagated pecans, American Society for Horticultural Science Annual Conference, Waikoloa, HI, September 22, 2017
- M. Y. Thompson* (presenter), **R.J. Heerema**, J.J. Randall, and D. VanLeeuwen. Differential expression of key flowering genes in response to plant growth regulator application and alternate bearing in pecan, American Society for Horticultural Science Annual Conference, Waikoloa, HI, September 20, 2017
- M. Y. Thompson*, J.J. Randall, **R.J. Heerema** (presenter), and D. VanLeeuwen. Exogenous plant growth regulators show promise for management of alternate bearing in pecan, American Society for Horticultural Science Annual Conference, Waikoloa, HI, September 20, 2017
- J. French* (presenter), **R. Heerema**, and R. Flynn. Pecan rootstock maternal genotype: Implications for nutrient uptake in alkaline soils, International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems, Bologna, Italy, August 30, 2016

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- **R. Heerema**, J.L. Walworth, B. Dungan, Y. Wang* (presenter), and F. O. Holguin, Soil-applied zinc-EDTA: Effects on dormant-season shoot and root carbohydrate storage reserves in ‘Wichita’ pecan grown on an alkaline and calcareous soil, American Society for Horticultural Science Conference, Atlanta, GA, August 11, 2016
- Y. Wang* (presenter), J. Walworth, B. Dungan, R. Heerema, and F. O. Holguin. ‘Nutraceutical properties including antioxidant capacity of ‘Wichita’ pecan kernels are affected by soil zinc fertilizer application’, Institute of Food Technologists Annual Meeting and Food Expo, Chicago, IL, July 16-19, 2016
- Y. Wang* (presenter), J.L. Walworth, **R.J. Heerema** and F.O. Holguin. Antioxidant capacity and zinc content of ‘Wichita’ pecan kernels are increased by soil zinc fertilizer application. American Society for Horticultural Science Conference, New Orleans, LA, Aug. 7, 2015
- P. Andrade-Sanchez, B. Lewis, and **R. Heerema** (presenter). Mechanical pruning frequency and direction impacts on light interception in southwestern pecan orchards. American Society for Horticultural Science Conference, New Orleans, LA, Aug. 7, 2015
- **R. Heerema** (presenter), J. Moran-Duran, and J. French, ‘Foliar-applied Stimplex® crop biostimulant increases photosynthesis in pecan seedlings irrigated with saline water’, Plant Growth Regulation Society of America Conference, Kailua Kona, HI, July 21, 2015
- **R. Heerema** (presenter), S.A. Moran, and J.M. French. Foliar-applied Stimplex® increases photosynthesis in pecan seedlings irrigated with saline water. Plant Growth Regulation Society of America Conference, Keauhou Bay, HI, July 21, 2015
- **R. Heerema** (presenter) and J. Walworth. Soil-applied zinc-EDTA: Photosynthesis in ‘Wichita’ pecan grown on an alkaline and calcareous soil. International Horticulture Congress, Brisbane, Australia, August 22, 2014
- J. Walworth (presenter) and **R. Heerema**. Soil-applied zinc-EDTA: Growth and nutrient acquisition of non-bearing pecan grown on an alkaline and calcareous soil. International Horticulture Congress, Brisbane, Australia, August 22, 2014
- J. Sherman* (presenter) and **R. Heerema**. Leaf manganese concentration for optimum photosynthesis of pecan in the Mesilla Valley, New Mexico. International Symposium on Physiological Principles and Their Application to Fruit Production. Geneva, NY, March 26-28, 2014

Recent Presentations Before Professional Societies—Oral Presentations

- K. Cervantes, **R. Heerema**, and J. Randall. Microbiome composition of pecan seedlings is influenced by cultivar of maternal seed source. American Society for Horticultural Science Conference, Chicago, IL, August 2, 2022.

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- J. Wood (Presenter), C. Cramer, R.L. Steiner, , B. J. Schutte, R. Heerema, I. Guzman. *Allium* physiological response to biotic and abiotic stress, Botany 2021 (Virtual), August 11, 2021.
- K. Cervantes (Presenter), **R. Heerema**, and J. Randall, Microbiome analysis of *Carya illinoensis* seedlings, UC Davis Nature Conference: Harnessing the Plant Microbiome (Virtual), October 23, 2021.
- **R. Heerema** (presenter), Curt Pierce, and B. Stringam. Can we improve the water balance for irrigated pecans? Sustainable Water Resources Management in the Rio Grande/Rio Bravo Basin Symposium, El Paso, TX, January 8, 2020.
- C. Pierce (presenter)*, **R. Heerema**, and B. Stringam. Does a partial root zone drying irrigation regime increase water use efficiency in field-grown pecans?, International Conference on Irrigation and Drainage, United States Committee on Irrigation and Drainage, Reno, NV, November 6, 2019.
- Pecan Maternal Genotype: Implications for Nutrient Uptake Efficiency in Alkaline Soils, American Society for Horticultural Science Conference, Washington, DC, August 3, 2018.
- Pecan maternal genotype: Implications for nutrient uptake in alkaline soils, American Society for Horticultural Science Conference, Washington, DC, August 3, 2018.
- Mechanical pruning improves pecan kernel antioxidant capacity over three consecutive harvest years, American Society for Horticultural Science Conference, Atlanta, GA, August 10, 2016.
- Manganese nutrition and photosynthesis in pecan. Western Nutrient Management Conference, Reno, NV, March 6, 2015.
- Pecan kernel antioxidant capacity and oil composition are affected by mechanical pruning and by nut position in tree canopy. International Horticulture Congress, Brisbane, Australia, August 18, 2014.

Recent Presentations—Selected Presentations at Industry Conferences and Educational Programs

- Diseases and disorders of nut crops, Luna County Pesticide Applicators CEU Workshop, Deming, NM, December 15, 2022
- Fruit and nut trees for New Mexico, Doña Ana County Master Gardeners, Las Cruces, NM, November 1, 2022
- Bacterial leaf scorch. New Mexico Pecan Growers Association Conference, Las Cruces, NM, October 28, 2022
- Diagnosing and mitigating salt issues in western pecans. New Mexico Pecan Growers Association Conference, Las Cruces, NM, October 28, 2022
- Improving irrigation strategy in pecan orchards. Western Pecan Growers Association Webinar, Las Cruces, NM (presented on Zoom), September 13, 2022
- Sustainable management of pecan orchards in the face of climate change. Día del Nogalero, Delicias, Chihuahua, Mexico, September 8, 2022

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- Pecan root-rhizosphere microbiome, Arizona Pecan Growers Association Conference, Tucson, AZ, August 26, 2022
- Pecan cultivars, California Pecan Growers Association Conference, Yuba City, CA, April 6, 2022
- Avoiding the common pitfalls in pecan orchards, California Pecan Growers Association Conference, Yuba City, CA, April 6, 2022
- What's causing the leaf scorch in my orchard?, Western Pecan Growers Association Conference, Las Cruces, NM, March 9, 2022
- Pecan Varieties and Rootstocks for New Mexico, New Mexico Crop Production Association, Ruidoso, NM, January 25, 2022
- Increasing irrigation efficiency in pecan (presented on Zoom), Western SARE Conference, Las Cruces, NM, December 9, 2021
- Overview and advances in pecan pest management, Luna County Pesticide Applicators Workshop, Deming, NM, November 16, 2021
- Pecan rootstocks: How they affect pecan tree performance, New Mexico Pecan Growers Association Conference, Las Cruces, NM (recorded and video presented at conference), October 29, 2021
- Protecting pecan orchards from freeze injury, New Mexico Pecan Growers Association Conference, Las Cruces, NM (recorded and video presented at conference), October 29, 2021
- Pecan research, Ag Career Fair (for high school students), Las Cruces, NM, October 1, 2021
- Pecans in New Mexico, AG Venture Days (for 3rd graders), Las Cruces, NM, September 29, 2021
- Impact of orchard floor weed and plant competition in pecan, Western Pecan Growers Association Webinar, Las Cruces, NM (presented on Zoom), September 7, 2021
- Protecting pecan orchards from freeze injury, Arizona Pecan Growers Association Conference, Tucson, AZ, August 27, 2021
- Pecan irrigation research, Leyendecker Plant Sciences Research Center Field Day, Las Cruces, NM, August 25, 2021
- Healthier orchards means *MORE* health benefits! Texas Pecan Growers Association Conference, San Marcos, TX, July 20, 2021
- Pruning and light management, El Paso County Pecan Field Day, Canutillo, TX, July 15, 2021
- Step-by-step guide to field diagnostics, University of California Pistachio Short Course (virtual), Davis, CA, November 12, 2020
- The New Mexico pecan industry, Día del Nogalero, Delicias (virtual), Chihuahua, Mexico, August 17, 2020
- Environmental stress in pecans, Arizona Pecan Growers Association Conference, (virtual), Tucson, AZ, August 7, 2020
- Cultural practices for managing pests in pistachio and pecan orchards, Pistachio and Pecan Pest Management Workshop, Alamogordo, NM, February 25, 2020.
- Crop irrigation needs, On-Farm Water Conservation and Irrigation Efficiency

Workshop, Las Cruces, NM, February 22, 2020.

- Irrigation systems, On-Farm Water Conservation and Irrigation Efficiency Workshop, Las Cruces, NM, February 22, 2020.
- Planting, pruning, irrigating young pecan orchards, Linwood Nursery Field Days, Eloy, AZ, February 18, 2020 and Las Cruces, NM February 20, 2020.
- Soils in pecan orchards, East Picacho Elementary pecan orchard field trip, Las Cruces, NM, December 6, 2019.
- Pests and diseases of nut crops, Luna County Pesticide Applicator Workshop, Deming, NM, November 8, 2019.
- Meeting your orchard's season-long nitrogen needs, New Mexico Pecan Growers Association Conference, Las Cruces, NM, October 25, 2019.
- Ask the plant: Plant-based irrigation scheduling for pecans (poster presentation), The Future of Water in the Middle Rio Grande Basin: A Science Exhibition, Las Cruces, NM, October 15, 2019.
- Heerema, R. (Presenter), Pierce, C., Stringam, B., Assessing water use efficiency on field-grown pecans under a partial root zone drying irrigation regime (poster presentation), The Future of Water in the Middle Rio Grande Basin: A Science Exhibition, Las Cruces, NM, October 15, 2019.
- Cosechando luz solar y la fotosíntesis en nogal (presented in English with Spanish translation), Simposio Internacional de nogal pecanero, Hermosillo, Sonora, Mexico, September 5, 2019.
- Fotosíntesis: Transformando luz, aire y agua en nueces (presented in English with simultaneous Spanish translation), Día del Nogalero, Delicias, Chihuahua, Mexico, August 29, 2019.
- Photosynthesis: Turning sunlight, air, and water into pecans, Texas Pecan Growers Association Conference, Frisco, TX, July 16, 2019)
- Heerema, R., El Paso Texas Pecan Field Day, Canutillo, Texas, "Pecan mineral nutrition". (July 2, 2019).
- What are we learning about growing pecans at New Mexico State University? Sigma Xi Science Café. Las Cruces, NM, April 25, 2019.
- Pecan and other nut trees in the home orchard, Lea County Master Gardeners, Hobbs, NM, March 28, 2019.
- Fertilizers and nutrition: Fertility in pecans, Lea County Pecan Program, Hobbs, NM, March 28, 2019.
- Photosynthesis: Turning sunlight, air, and water into pecans, Western Pecan Growers Association Conference, March 4, 2019.
- Nut crops for northern New Mexico, New Mexico Fruit Growers Workshop, Alcalde, NM, March 1, 2019.
- Fertilizers and nutrition: Fertility in pecans, New Mexico Crop Production Association Conference, Ruidoso, NM, January 21, 2019.
- Tree fruit and nut crop pest management, Bernalillo County Pesticide Applicator's Workshop, Albuquerque, NM, November 29, 2018.
- Pests and diseases of tree nut crops, Doña Ana Pesticide Applicator's Workshop, Las Cruces, NM, November 27, 2018.

- Advancements in pecan rootstocks. New Mexico Pecan Growers Association Conference, Las Cruces, NM, November 2, 2018.
- 5th Western Pecan Production Short Course, Las Cruces, NM (four presentations):
 - Orchard design and planting, October 15, 2018.
 - Pecan cultivars, October 15, 2018.
 - Irrigation scheduling, October 16, 2018.
 - Pruning mature orchards, October 16, 2018.
 - Pecan diseases and nematodes (with Jennifer Randall and Joshua Sherman).
- Zinc aplicado al suelo para nogales: incluso en suelos de pH alcalino. Día del Nogalero, Delicias, Chihuahua, Mexico, August 31, 2018.
- Pecan rootstocks for the southwestern states, Arizona Pecan Growers Association Conference, Tucson, AZ, August 24, 2018.
- Photosynthesis: Turning sunlight, air, and water into Pecans, Oklahoma Pecan Growers Association, Quawpaw, OK, June 15, 2018.
- Orchard site selection, Western Pecan Growers Association Conference, Las Cruces, NM, March 5, 2018.
- Otero County Pistachio Workshop, Alamogordo, NM (two presentations):
 - Fruit set and blanking in pistachio, February 2, 2018.
 - Irrigating pistachio orchards, February 2, 2018.
- Step-by-step guide to field diagnostics, University of California Pistachio Short Course, Visalia, CA, November 16, 2017.
- New Mexico Pecan Growers Association Conference, Las Cruces, NM (two presentations):
 - Diagnosing pecan disorders, October 18, 2017.
 - Pecan orchard pollination, October 18, 2017.
- ‘Factores que afectan el amarre de frutos en nogal (Fruit setting in pecan)’, Simposio Internacional de Nogal Pecanero, Hermosillo, Sonora, México, September 7, 2017.
- Modern pecan orchard design, Arizona Pecan Growers Association Conference, Tucson, AZ, August 25, 2017.
- Texas Pecan Growers Association Conference, Frisco, TX (two presentations):
 - Soil-applied zinc for pecans: Even in the Southwest, July 11, 2017.
 - Varietal, physiological, and climate effects on pecan quality (presented as part of a panel discussion), July 11, 2017.
- Protecting pecan orchards from freeze injury, Jimenez Pecan Conference, Jimenez, Chihuahua, Mexico, April 20, 2017.
- Soil-applied zinc for pecans, Georgia Pecan Growers Association, Tifton, GA, March 29, 2017.
- South Africa Pecan Conference, Hartswater, Northern Cape, South Africa (three presentations):
 - Pollination: The answer is blowing in the wind, March 14, 2017.
 - Mechanical pruning and light management (co-presenter with Dr. James Walworth), March 14, 2017.

- Pecan diseases and disorders, March 15, 2017.
- Pollination: The answer is blowing in the wind, Western Pecan Growers Association Conference, Las Cruces, NM, March 7, 2017.
- Impact of weed and plant competition in pecan, New Mexico Pecan Growers Association Conference, Las Cruces, NM, October 26, 2016.
- 4th Western Pecan Production Short Course, Las Cruces, NM (seven presentations):
 - Introduction to the pecan tree, October 17, 2016.
 - Orchard design and planting, October 17, 2016.
 - Pecan cultivars and rootstocks, October 17, 2016.
 - Training and pruning pecan orchards, October 17, 2016.
 - Propagation: grafting and budding, October 17, 2016.
 - Irrigation scheduling, October 18, 2016.
 - Measuring plant water status with a pressure chamber: a field demonstration, October 19, 2016.
- Health-promoting components of pecan kernels are increased by mechanical pruning and high sunlight, Arizona Pecan Growers Association Conference, Tucson, AZ, August 26, 2016.
- California Pecan Growers Association Conference, LaGrange, CA (two presentations):
 - Impacts of mechanical pruning frequency on light interception, yield, and nut quality (August 3, 2016).
 - Basic principles for training young pecan trees (August 3, 2016).
- Oklahoma Pecan Growers Association Conference and Field Day, Tulsa, OK (three presentations):
 - Impacts of mechanical pruning frequency on light interception, yield, and nut quality (June 3, 2016).
 - Irrigation scheduling using soil moisture monitoring and plant-based methods (June 3, 2016).
 - Mechanical pruning for Oklahoma (at field day, June 4, 2016).
- Experiences with hedging practices in the West, Georgia Pecan Growers Association Annual Educational Conference, Perry, GA, March 30, 2016.
- South African Pecan Producers Association Short Course, Bloemfontein, South Africa (seven presentations):
 - Introduction to pecans and the pecan industry, April 20, 2016.
 - Orchard design and planting (with Dr. L. Wells), April 20, 2016.
 - Pecan cultivars and rootstocks (with Dr. L. Wells), April 20, 2016.
 - Training and pruning pecan orchards, April 20, 2016.
 - Propagation: grafting and budding, April 20, 2016.
 - Tree water requirements and irrigation scheduling, April 21, 2016.
 - Orchard floor management (with Dr. L. Wells), April 21, 2016.
- Western Pecan Growers Conference and Tradeshow, Las Cruces, NM (two presentations):
 - Scheduling irrigations with a pressure chamber, March 8, 2016.
 - Discovery of pecan bacterial leaf scorch in the Southwest, March 7,

2016.

- New Mexico Pecan Growers Association Conference, Las Cruces, NM, October 21, 2015 (two presentations):
 - o Micronutrients in Pecans.
 - o Diagnosing salt issues in pecans.
- Efecto de la periodicidad de la poda mecánica en nogal, Simposio Internacional de Nogal Pecanero, Hermosillo, Sonora, Mexico, September, 10, 2015.
- Western Pecan Growers Association Conference, Las Cruces, NM (two presentations):
 - o Mechanical pruning, March 3, 2015.
 - o Step-by-step guide to pecan orchard diagnoses, March 2, 2015.
- Costs of Pecan Production (with Dr. L. Wells). National Pecan Shellers Association Conference, Seattle, WA, September 19, 2014.
- Pecan Cultivars. Arizona Pecan Growers Association, Tucson, AZ, August 29, 2014.
- Pecan Production in the Semi-Arid Southwestern US, Australian Pecan Growers Association Conference, Beaudesert, Queensland, Australia, August 23, 2014.
- Meeting your orchard's season-long N demand. Oklahoma Pecan Growers Association Conference, Tulsa, OK, June 6, 2014.
- Diagnosing nutrient disorders in western pecans. Western Pecan Growers Association, Las Cruces, NM, March 3, 2014.
- Developments in the pecan industry in the west. Southeastern Pecan Growers Association Conference, Biloxi, MS, February 22, 2014.

Selected Recent Extramural Funding

- Adapting pistachio production to a changing climate. Multi-state project funded by USDA-NIFA-SCRI through University of California Davis (Dr. Pat Brown, PD); the total NMSU award was \$411,347.00 (over 4 years; R. Heerema, PI). Start Date: September 1, 2022
- Trees for the future: Coordinated development of genetic resources and tools to accelerate breeding of geographic and climate adapted pecan trees. Multi-state project funded by USDA-NIFA SCRI at \$8,045,985 total (over 4 years) with NMSU as lead institution (R.J. Randall, PD; R.J. Heerema co-PD). \$561,196 total (over 4 years) for extension and research portions of project led by R.J.Heerema (project start date 9/1/22).
- Shaping the New Mexico pecan root-soil microbiome to improve orchard health and productivity. Funded by NMDA Specialty Crops Block Grant Program. \$76,413 total over 2 years (project start Oct., 2021).
- Securing a climate resilient water future for agriculture and ecosystems through innovation in measurement, management, and markets. Funded by USDA-NIFA-REE at \$10 million total (over 4 years) with University of California-Merced as lead (Dr.

Joshua Viers, PD); the total NMSU award was \$1,640,000 (Dr. Sam Fernald, PI) with \$365,723 for the extension and research portion led by R. Heerema (cooperating with Dr. David Dubois). Start Date: September 15, 2021.

- Coordinated development of genetic tools for pecan. Multi-state project funded by USDA-NIFA SCRI at \$4,404,284 total (over 5 years) with NMSU as lead institution; \$185,158 total (over 5 years) for extension and rootstock trial portions of the project led by R. Heerema (project start September 1, 2016).
- Sustainable water resources for irrigated agriculture in a desert river basin facing climate change and competing demands: From characterization to solutions. USDA-NIFA, AFRI. \$ 4.9 million total (over 5 years) overall with University of Texas, El Paso as lead; \$336,000 total (over 5 years) for NMSU pecan portion led by R. Heerema (start March 1, 2015)
- Systems approach at improving the long-term competitiveness of U.S. pecans based on their nutritional and health-promoting components. USDA-NIFA, SCRI. \$1,219,636 total (over 4 years) overall with University of Georgia as lead; \$192,198 total (over 4 years) for NMSU horticulture portion (with R. Heerema, P.I.).
- Precision Canopy and Water Management of Specialty Crops through Sensor-Based Decision Making. NMSU portion funded by NIFA-SCRI at \$156,875 total (over 3 years, with R. Heerema as P.I.). (project start October, 2010)

Graduate Students Advised

- Sarahi Bracamontes (MS; started Jan. 2023)
- Jamin Miller (MS; started Jan. 2023)
- Stephen Berko (MS; co-advisor with Dr. Rolston St. Hilaire)
- McKenzie Stock (MS; co-advisor with Dr. Nicole Pietrasiak; expected Dec. 2023)
- Curt Pierce (Ph.D.; completed Dec. 2021)
- Jason French (Ph.D.; withdrawn from program)
- Marisa Thompson Potter (Ph.D.; completed July 7, 2017)
- Cody Runyan (MS; withdrawn from program)
- Yuquing Wang (MS; co-advisor with Dr. Omar Holguin; completed April 6, 2016)
- Sara Moran (MS; co-advisor with Dr. Robert Flynn; completed Oct. 29, 2015)
- Joshua Sherman (MS; completed May, 2015)
- Marisa Thompson Potter (MS; completed Dec. 2011)
- Pablo Teveni (MS; completed May, 2011)

Membership in Professional Societies/Associations

- American Society for Horticultural Science
- International Society for Horticultural Science
- American Pomological Society
- Plant Growth Regulator Society of America
- Western Pecan Growers Association (honorary board member)

Awards and Recognition

- USDA NIFA Partnership Award in Program Improvement Through Global Engagement category (received as part of Sustainable Water Resources for Irrigated Agriculture in the Middle Rio Grande Basin grant team. Awarded in 2020 and presented virtually on October 6, 2022).
- Educational Aids Blue Ribbon (received as part of author team for NMSU Extension Circular entitled GMO crops in New Mexico agriculture), American Society for Agricultural and Biological Engineers, 2019.
- Distinguished Extension Award, New Mexico State University College of Agricultural, Consumer, and Environmental Sciences, May 5, 2017.
- Team Award (received as part of Plant Pest Response Network), New Mexico State University College of Agricultural, Consumer, and Environmental Sciences, May 5, 2017.
- State Early Career Award, Epsilon Sigma Phi, 2012.