JEFFREY M. WARREN

Plant Physiological Ecology 10/2020
Environmental Sciences Division & Climate Change Science Institute
Oak Ridge National Laboratory
Building 4500N, Oak Ridge, TN 37831–6422
warrenjm@ornl.gov Phone: (865) 241-3150

https://www.ornl.gov/staff-profile/jeffrey-warren https://orcid.org/0000-0002-0680-4697

RESEARCH EXPERIENCE

2010- Staff Scientist, Oak Ridge National Laboratory
- Response of terrestrial ecosystems to climate change; neutron imaging of plants/soils

2007-09 Research Associate, Oak Ridge National Laboratory
- Sweetgum tree ecophysiology under Free-air CO_2 enrichment (FACE) treatments

2002-07 Postdoctoral Research Forester, USDA Forest Service PNW Research Station
- Soil, plant, ecosystem water relations in temperate forests

1999-02 Graduate Fellow, US EPA Science to Achieve Results Program (STAR)
- UV-B radiation impacts on tree ecophysiology

2001-02 Research Technician, Washington State University
- Analytical plant biochemistry

1997-02 IT Systems Administrator, Washington State University
- Lead systems administrator of CAHE computer teaching labs

1994-06 Research Assistant, NC State University Forest Nutrition Cooperative
- Ecophysiology, growth-differentiation balance

EDUCATION

2002 Ph.D. Washington State University (*Tree Physiology*)
1996 M.S. North Carolina State University (*Forest Science/Ecology*)
1991 B.S. Miami University (*Engineering Physics*)

PROFESSIONAL ACTIVITIES & RECOGNITION

Funding and Awards

2009- US DOE TES SPRUCE Project - Spruce and Peatland Responses Under Climatic and Environmental Change - lead investigator for plant C and water relations.

2010- ORNL High Flux Isotope Reactor or SNS Neutron Beam Time awarded (ongoing).

2014- US DOE TES Root Functioning Project – Evaluation and improvement of representation of dynamic root functioning in earth system models

2015- US DOE Next Generation Ecosystem Experiments - Tropics (NGEE-T) Project – Measurement and modeling response of tropical evapotranspiration to drought – Phase 2 Work Package Lead – Plant Water Sourcing

2018- US DOE TES – "Accounting for carbon and energy edge effects in forest boundaries: A collaboration with ORNL, NIST, and Boston University," with M. Mayes

2018-20 ORNL Laboratory Directed Research and Development Program: "Co-evolving plant traits and hydrologic environment within watershed models," with E. Coon, S. Painter, A. Walker.

2016-18 ORNL Laboratory Directed Research and Development Program: "Impact of extreme weather events on plant species, competition and ecological function," with L. Gu, D. Ricciuto, S. Wullschleger and H. Bilheux.

2016 CCSI funding awarded for exploring development of a "Remote Ecosystem Robotic Sampler," with V. Varma, R. Norby and A. Aaron.
2015 ORNL Significant Event Award for contributions to the deployment of DOE's SPRUCE Project (Spruce and Peatland Responses under Climatic and Environmental Change)
2015 ORNL Environmental Sciences Division Requisition of extreme walk-in growth chamber
2015 ORNL Significant Event Award for contributions to the successful NGEE-T proposal.
2014 Stanley I. Auerbach Award Recipient for Excellence in Environmental Sciences, Environmental Sciences Division, Oak Ridge National Laboratory
2014-16 ORNL Laboratory Directed Research and Development Program: "A genome-enabled approach for predicting plant functional traits in dynamic vegetation models," with D. Weston, W. Muchero, L. Gu, S. Wullschleger, A. Walker, G. Tuskan, P. Ranjan.
2014 ORNL Performance Reward for successful publication of high impact *Tansley* review on root function in models.
2013-15 ORNL Laboratory Directed Research and Development Program, "New measurement technology for physical and biological characterization of fundamental carbon cycle processes in the subsurface environment," with T. McIntyre, P. Fuhr, P. Hanson, R. Kisner, C. Schadt.
2010-15 US DOE TES PiTS Project - Partitioning in Trees and Soils: Field research facilities for evaluating dynamic carbon partitioning representations in global models.
2010-12 ORNL Laboratory Directed Research and Development Program & UT-Knoxville Joint Directed Research and Development Program, "Neutron imaging of fluids within plant soil-groundwater systems," with H. Bilheux, J. Horita and E. Perfect.
2009 ORNL Capital Funds Requisition of Picarro water isotope analyzer
2008 ORNL Performance Award for successful completion and final harvest of the long-term Free-Air CO_2 Enrichment (FACE) study
2008 ORNL Seed Money Proposal, "*In situ* neutron imaging of soil-plant water flux," with S. Wullschleger and H. Bilheux
2003 Dissertations Initiative for the Advancement of Climate Change Symposium I Scholar
1999 EPA Science to Achieve Results Graduate Fellowship Recipient
1999 Washington State University Competitive Summer Stipend Recipient
1995 North Carolina Wildlife Federation Scholarship Recipient

Professional Involvement

2021- Organizer – Oral session. "Plant water relations under increasing VPD – linkages and gaps from soil to atmosphere," 2021 ESA Annual Meeting – Long Beach, August 1-6, 2021.
2019- ORNL SNS Second Target Station Biological and Environmental Systems Development Team
2018- ORNL Mentoring Program
2018 ORNL Management Boot Camp – six-day course on leadership, performance management, finance, networking, ORNL policies, procedures and support resources.
2018 Co-Organizer – Oral session. "Seeing is Believing: Advances in Understanding of Root-Rhizosphere Dynamics," at 2018 AGU Annual Meeting – Washington, DC.
2018 Co-Organizer – Oral session. "Ecophysiological Responses to Experimental Warming in Vascular Plants," 2018 ESA Annual Meeting – New Orleans, August 5-10, 2018.
2017 ORNL Initiative Review Committee (IRC) member on the Integrated Studies of Complex Biological Systems initiative for the Laboratory Directed Research & Development (LDRD) Director's R&D Fund
2017 Organizer – Oral session. "Extreme Weather Events and Ecosystem Function - Using Experiments and Modeling to Provide Ecological Foresight," 2017 AGU Annual Meeting – New Orleans, December 11-15, 2017.
2017 Co-Organizer – Oral session. "Plant-Soil Interactions in the Rhizosphere: Experimental and Computational Advances," 2017 AGU Annual Meeting – New Orleans,

December 11-15, 2017.

2016 ORNL Professional Development Class: 'Seven Habits of Highly Effective People"

2016 Served on expert panel for a workshop focused on "Adaptive Silviculture for Climate Change" (ASCC) at the J.W. Jones Ecological Research Center January 12-14, 2016

2015-17 ORNL Environmental Sciences Division Annual Awards Committee

2014 Co-organizer – Oral session. "A Path Forward for Improved Representation of Fine Roots in Large-Scale Models: Linking Models, Data, and Experiments," 2014 ESA Annual Meeting – Sacramento, August 10-15, 2014.

2014 ORNL Professional Development: One-on-One Coaching - Advanced Presentation Skills

2014 Organizing Committee for the International Symposium on Evapotranspiration: Challenges in measurement and modeling from leaf to the landscape scale, Raleigh, NC, April 7-11

2013 Scientific Committee for the 9th International workshop on Sap Flow, Ghent, Belgium, June 4-7

2011 Technical Program Committee for the Future of Instrumentation International Workshop, ORNL, Oak Ridge, TN, November 7-8.

2010-12 ORNL Seed Money Review Committee member for the Laboratory Directed Research & Development (LDRD) program

2008- ORNL Instrument Development Team of proposed new neutron research beam line at Versatile Neutron Imaging Instrument at the Spallation Neutron Source (VENUS)

2008- Application Review Committee – *Dissertations Initiative for the Advancement of Climate Change Research Symposium* (DISCCRS)

2008 Organizer – Oral session. "Ecohydrology: Integrating Current Knowledge of Water Flux along the Soil-Plant-Atmosphere Continuum." ESA Annual Meeting – Milwaukee.

2005- Various outreach activities including Centennial Open House "Exploring tree canopies," College of Forestry, Oregon State University; Tree-mendous technology, Ball State University electronic field trip program (Grades 3-8); "Timber," Discovery Channel documentary, Knoxville News Sentinel story on ORNL FACE harvest, WBIR local news feature on SPRUCE project, National Geographic JASON project on PITS project, Ark Media climate change documentary, ORNL News Release to PhysOrg: "Carbon Tracking and Climate Models", ClimateWire story on SPRUCE project, Medill Reports story on HFIR neutron imaging of root water flux, Knoxville Mercury story on Climate Change and Extreme Events, Presentations of ORNL's terrestrial ecosystem science research and tours of ecological research sites, Bearden Middle School science class.

2001- Peer Review: *ANR (French National Research Agency), DFG (German Research Foundation), US DOE TES Panels, US DOE SBIR/STTR*, *US EPA, FWO (Research Foundation – Flanders, Belgium), IMMAQ (Institute for Multidisciplinary Research in Quantitative Modelling and Analysis – Belgium), US NASA, NWO (Netherlands Organization for Scientific Research), US NSF, ORNL LDRD, ORNL Neutron Scattering Science Program*

2013- Editorial Positions: *Associate Editor for Frontiers in Forests and Global Change - Forest Ecophysiology, Frontiers in Plant Science (Guest Editor for special issues on 1) 'Extreme Events' and 2)'Water Use Efficiency'), Frontiers in Plant Science – Biophysics & Modeling (Editorial Board), Rhizosphere (Editorial Board)*

2001- Ad Hoc Reviewer (10-20 per year) for journals including: *Acta Horticulturae, Acta Physiologia Plantarum, Agricultural and Forest Meteorology, AoB Plants, CRC Press, Ecohydrology, Ecological Applications, Environmental Research Letters, Forest Ecology & Management, Forest Science, Frontiers in Zoology, Fungal Ecology, Global Change Biology, Hydrological Processes, Isotopes in Environmental & Health Studies, J. Arid Environments, J. Applied Ecology, J. Environmental Quality, J. of Plant Research, Land Degradation and Development, Mycorrhiza, Nature Climate Change, Neutron Imaging & Applications (book), New Phytologist, Northwest Science,*

Oecologia, Plant and Soil (top reviewer 2013), PLOS1, Rhizosphere, Sensors, Soil & Tillage Research, South African J. Botany, Tree Physiology, Water Resources Research.

1993- Member (past and present): *American Association for the Advancement of Science*, *American Geophysical Union, Ecological Society of America, Phi Kappa Phi, Society of American Foresters, Soil Science Society of America, Xi Sigma Pi*

University/Student Involvement

2010- Adjunct Associate Professor – Department of Forestry, Wildlife and Fisheries, UT-Knoxville.

2002- Supervised, advised or hosted undergraduate or post-baccalaureate interns (32), MS (6) and PhD (7) graduate students, postdocs (7), lab technicians (4), served as MS/PhD thesis advisor and external reviewer for student theses and faculty proposals.

2005- Guest Lecturer/Seminars/Field Trips – University Program in Ecology - Duke University, Nicholas School of the Environment – Duke University, Bordeaux Sciences Agro, France; Department of Forestry, Wildlife and Fisheries, University of Tennessee; Department of Forest Science, Oregon State University; Department of Natural Resources and Environmental Sciences, Alabama A&M University; Department of Soil Science, University of Saskatchewan, National Institute of Amazonian Research (INPA – Brazil), ORISE DOE student interns, DOE Science Undergraduate Laboratory Internship (SULI) and Higher Education Research Experience (HERE) Programs, Bioenergy Educator Training Course, middle and elementary school science classes.

1998 Silviculture Instructor – Dept. of Natural Resource Sciences, Washington State University

1997-99 Teaching Assistant – Dept. of Natural Resource Sciences, Washington State University

1993-96 Teaching Assistant & Tutor – Dept. of Forest Resources, North Carolina State University

Presentations (by Coauthors) >220

Presentations (by Warren) – Invited Papers & Posters

(1) Warren, JM. 2000. "Effects of enhanced UV-B radiation on tree biochemistry and herbivory." *Poster*, EPA STAR Graduate Fellowship Conference, Washington, D.C.

(2) Warren, JM. 2001. "Alteration of foliar flavonoid composition induced by enhanced UV-B radiation in field-grown *Pinus ponderosa, Quercus rubra* and *Pseudotsuga menziesii*." *Poster*, William R. Wiley Research Exposition, WSU, Pullman, WA.

(3) Warren, JM. 2003. "UV-B radiation, Trees, and Herbivory." *Oral*, Dissertations Initiative for Climate Change Research Symposium, Guanica, Puerto Rico.

(4) Warren, JM. 2005. "Tree response to environment: radiation, nutrients and water." *Oral*, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC.

(5) Warren, JM. 2006. "Hydro-physiology in Pacific NW conifers - from fungi to foliage." *Oral*, USDA, Agricultural Research Service, Crops Pathology/Genetics Research Unit Special Seminar, UC Davis, Davis, CA.

(6) Warren, JM. 2006. "Plant Response to Environment - growth vs. defense." *Oral*, USDA, ARS, Tree Fruit Research Laboratory, Wenatchee, WA.

(7) Warren, JM. 2007. "Hydro-physiology in Pacific NW conifers - from fungi to foliage." *Oral*, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN.

(8) Warren, JM. 2008. "Ecohydrology in a changing world." *Oral*, Dept. of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL.

(9) Warren, JM. 2008. "Hydro-physiological response to drought by trees developed under elevated CO_2." *Oral*, Young Evolving Scientist's Seminar Series, Oak Ridge National Laboratory, Oak Ridge, TN.

(10) Warren, JM, RJ Norby & SD Wullschleger. 2008. "Extreme climatic events drive ecosystem water flux under elevated CO2 in a temperate forest." *Poster*, Joint BSD-ESD Advisory Committee Meeting Reception, Oak Ridge National Laboratory, Oak Ridge, TN.

(11) Warren, JM. 2008. "Physiological and environmental controls of tree water use." *Oral*, Annual Meeting of the Ecological Society of America, Milwaukee, WI.

(12) Warren, JM, H. Bilheux, S. Wullschleger. 2009. "Neutron imaging of plant-soil systems at Oak Ridge National Lab." *Poster,* Office of the Laboratory Director LDRD annual poster session, Oak Ridge National Laboratory, Oak Ridge, TN.

(13) Warren, JM. 2009. "FACE Drought or Die - Climate Change and Terrestrial Plant Water Relations." *Oral,* Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN.

(14) Warren, JM. 2010. "Terrestrial water relations and climate change." *Oral,* Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.

(15) Warren, JM, P Hanson, C Iversen, J Mao, R Norby, D Ricciuto, P Thornton, S Wullschleger. 2012. "Root Function – toward a better model representation of root functional control of C uptake." *Oral,* DOE-BER Terrestrial Ecosystem Science PI Meeting, Washington, DC.

(16) Warren, JM. 2012. "New advances in root imaging – in situ flux of water." *Oral,* Fall meeting of the American Geophysical Union, San Francisco, CA.

(17) Warren, JM. 2013. "Refining Climate Models." *Oral,* DOE ORISE Student Intern Program, Oak Ridge, TN.

(18) Warren, JM, H Bilheux, M Kang, S Voisin, C-L Cheng, J Horita, E Perfect. 2013. "Roots revealed – neutron imaging insight of spatial distribution, morphology, growth and function." *Oral*, Meeting of the Americas (AGU), Cancun, Mexico.

(19) Warren, JM, J Childs, P Hanson, A Jensen, S Wullschleger. 2013. "Sap flow and water relations in an ombrotrophic *Picea mariana – Sphagnum* bog subject to climate change treatments." *Oral*, 9th International Workshop on Sap flow, Ghent, Belgium.

(20) Warren, JM. 2013. "Carbon allocation and partitioning" *Oral*, Guest lecture Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.

(21) Warren, JM. 2014. "Roots, Root Function and Models." *Oral*, ORNL Plant Microbe Interfaces Program, Oak Ridge, TN.

(22) Warren, JM. 2014. "Assessment of root water dynamics in situ and leveraging mechanistic knowledge of root function into terrestrial biosphere models." *Oral*, Rhizosphere Imaging and Genomics Seminar Series, Department of Soil Science, University of Saskatchewan, Saskatoon, SK.

(23) Warren, JM. 2015. "Spruce and Peatland Responses Under Climatic and Environmental Change." *Oral*, Featured speaker for meeting of the Smoky Mountain chapter of the American Meteorological Society. University of Tennessee, Knoxville, TN.

(24) Warren, JM. 2015. "Neutron Imaging of Plant and Soil Water." *Oral*, Invited speaker to visiting researchers from the International Maize and Wheat Improvement Center (CIMMYT), ORNL, Oak Ridge, TN.

(25) Warren, JM. 2015. "Spruce and Peatland Responses Under Climatic and Environmental Change." *Oral*, Guest lecture Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN.

(26) Warren, JM. 2015. "SPRUCE – A new large-scale whole ecosystem climate change experiment." *Oral*, Invited speaker to visiting Brevard College Physics, Biology, and Geology faculty and students, ORNL, Oak Ridge, TN.

(27) Warren, JM. 2016. "Carbon Partitioning from Foliage to Fungi - a Model-Experiment Case Study." *Oral*, Invited speaker for session on *Recent Advances in Belowground Ecology* at the annual DOE TES PI Meeting, Potomac, MD.

(28) Warren, JM. 2016. "Leveraging Root Mechanistic Function into Terrestrial Biosphere Models."

Oral, Invited class lecture for 'Functional Ecology of Trees' course, Nicholas School of the Environment, Duke University, Durham, NC.

(29) Warren, JM. 2016. "Ecophysiology at Oak Ridge – Use of Experimental Systems and Improved Mechanistic Understanding to Refine Climate Models." *Oral*, Invited speaker for the University Program In Ecology (UIC) in the Nicholas School of the Environment, Duke University, Durham, NC.

(30) Warren, JM. 2016. "Diurnal patterns of stem diameter and sap flow – correlation with capacitance and hydraulic strategy." *Poster,* NGEE-Tropics ENSO Research Meeting, San Francisco, CA.

(31) Warren, JM. 2017. "Predicting impacts of climate change on terrestrial ecosystems – state of the science." *Oral and field tour*, Bioenergy Educator Training Course: mitigating harmful emissions & SPRUCE tour. Oak Ridge, TN

(32) Warren, JM. 2017. "Application of neutron radiography to explore soil-rhizosphere-root water dynamics in situ." *Oral,* Copenhagen Plant Science Center / PlantLink Joint MaxIV and European Spallation Source Workshop, Lund, Sweden.

(33) Warren, JM. 2017. "Relationships and communications between trees via mycorrhizae." *Oral,* Led discussion on 'Intelligent Trees' documentary for graduate class at Bordeaux Sciences Agro, Gradignan Cedex – France. (via videoconference)

(34) Warren, JM. 2017. "Integrated measurements of plant and soil water relations – a case study from Oregon USA to be applied at ZF2." *Oral,* INPA - National Institute of Amazon Research, Manaus, Brazil.

(35) Warren, JM, S Bellaire, A Guha, E Ward. 2018. Morphological shifts in foliar traits and branch display for boreal tree and shrub species exposed to elevated temperature and CO_2." *Oral*, Annual Meeting of the Ecological Society of America, New Orleans, LA.

(36) Warren, JM, H Bilheux, P Bingham, A Johs, E Pierce, K Tobin, K DeCarlo, E Perfect. 2019. "Opportunities in neutron imaging of plants and soils." *Keynote Oral,* Workshop on X-ray and Neutron Imaging Applications in Soil Sciences. Biology Department and Lund Institute of Advanced Neutron and X-ray Science (LINXS) at Lund University, Lund, Sweden.

(37) Warren, JM. 2019. "Neutron imaging of soil, rhizosphere & root water dynamics." *Oral,* Workshop for Neutron Scattering Applications in the Biological and Environmental System Sciences at ORNL, Oak Ridge, TN.

(38) Warren, JM. 2019. "NGEE-Tropics - Linking tree traits, topography and soils to seasonal patterns of water use in the Central Amazon." *Oral,* INPA - National Institute of Amazon Research, Manaus, Brazil.

(39) Warren, JM. 2019. "Neutron imaging of soil, rhizosphere & root water dynamics." *Oral,* Biochemistry & Cellular and Molecular Biology Department, University of Tennessee Knoxville, TN.

(40) Warren, JM. 2019. "Beneath the Tip of the Iceberg - Roots, mechanistic functions & models." *Oral*, Invited class lecture for 'Root Ecology' course, Nicholas School of the Environment, Duke University, Durham, NC.

(41) Petridis L, Johs A, Warren JM. 2019. "Neutron Science for Biological and Environmental Systems." *Poster*, EESD's Scientific Advisory Committee Member Meeting, Oak Ridge.

(42) Warren, JM, HZ Bilheux, E Perfect, K Decarlo, K Marcacci, J-C Bilheux. 2020. "Neutron Imaging of Soil Rhizosphere & Root Water Dynamics." *Oral*, Goldschmidt Conference, Honolulu, HA. (virtual)

<u>Presentations (by Warren) – Offered Papers & Posters</u>

(43) Warren, JM, HL Allen and FL Booker. 1996. "Mineral nutrition, resin flow and phloem phytochemistry in loblolly pine." *Oral*, Annual meeting of the Ecological Society of America, Providence, RI.

(44) Warren, JM. 2000. "UV-B radiation, poplar phytochemistry and herbivory." *Oral*, 16th North American Forest Biology Workshop & the Western Forest Genetics Association Conference,

"The Impact of Global Environmental Change on Forests, and Impacts of Forests on Global Environmental Change," Merida, Mexico.

(45) Warren, JM, JH Bassman and S Eigenbrode. 2001. "Phytochemical changes induced in *Populus trichocarpa* by UV-B radiation and effects on cottonwood leaf beetle behavior." *Poster*, IUFRO Forest Canopy Processes Traveling Workshop in Oregon and Washington.

(46) Warren, JM, FC Meinzer, JR Brooks, J-C Domec, R Coulombe. 2003. "Soil H_2O dynamics and hydraulic redistribution at Wind River." *Oral*, Wind River Canopy Crane Research Facility annual meeting, Carson, WA.

(47) Warren, JM, JR Brooks, FC Meinzer, J-C Domec, R Coulombe. 2003. "Similarities in hydraulic redistribution of soil water in dry and moist coniferous forests." *Oral*, 4th North American Forest Ecology Workshop, Corvallis, OR.

(48) Warren, JM, FC Meinzer, J-C Domec and JR Brooks. 2003. "Initiation, control and magnitude of hydraulic redistribution." *Oral*, 3rd International Symposium on Dynamics of Physiological Processes in Woody Roots, Perth, Australia.

(49) Warren, JM, FC Meinzer, JR Brooks and JC Domec. 2004. "Vertical stratification of soil water storage and release dynamics in Pacific Northwest coniferous forests." *Oral*, Annual meeting of the Ecological Society of America, Portland, OR.

(50) Warren, JM, FC Meinzer, JR Brooks, J-C Domec, R Coulombe. 2004. Soil water hydraulic redistribution and release dynamics in Pacific Northwest coniferous forests. *Poster*, Wind River Canopy Crane Research Facility annual meeting, Stevenson, WA.

(51) Warren, JM, JR Brooks, FC Meinzer. 2006. "Can mycorrhizal fungi transport water between trees?" *Oral*, Wind River Canopy Crane Research Facility annual meeting, Stevenson, WA.

(52) Warren, JM, JR Brooks, FC Meinzer. 2006. "Hydraulic redistribution via mycorrhizal symbiots of pine." *Oral*, Annual meeting of the Ecological Society of America, Memphis, TN.

(53) Meinzer, FC, JM Warren, JR. Brooks. 2006. "Partitioning of soil water resources in an old-growth Douglas-fir/western hemlock forest." *Poster*, Annual meeting of the Ecological Society of America, Memphis, TN.

(54) Warren, JM, JR Brooks, MI Dragila, FC Meinzer. 2007. "Separating hydraulic redistribution from unsaturated liquid and vapor flow of soil water." *Poster*, Annual meeting of the Ecological Society of America, San Jose, CA.

(55) Warren, JM, R Norby, S Wullschleger. 2007. "Do extreme climatic events drive ecosystem water flux under elevated CO_2 in a temperate forest?" *Poster*, Fall meeting of the American Geophysical Union, San Francisco, CA.

(56) Warren, JM, C Iversen, J Ledford, RJ Norby. 2008. "Fine Root Dynamics Alter Biogeochemical Fluxes at Soil Depths up to 60 cm in a CO_2-Enriched Sweetgum Plantation." *Oral*, Joint annual meeting of GSA, SSSA-ASA-CSSA, Houston, TX.

(57) Warren, JM, R Norby, S Wullschleger. 2009. "Elevated CO_2 reduces water use, and shifts extraction downward in sweetgum." *Oral*, Annual meeting of the Ecological Society of America, Albuquerque, NM. (presented by Norby)

(58) Warren, JM, S Wullschleger, H Bilheux. 2009. "Neutron imaging of plant-soil systems at Oak Ridge National Lab." *Poster,* SSSA-ASA-CSSA International Annual Meetings, Pittsburgh, PA. (*Nov 1-5*).

(59) Warren, JM, R Norby, S Wullschleger. 2009. "Elevated CO_2 reduces water use, and shifts extraction downward in sweetgum." *Oral*, Annual meeting of the Ecological Society of America, Albuquerque, NM. (presented by Norby)

(60) Warren, JM, 2010. "Sweetgum plantation water use under elevated CO_2." *Oral*, A watershed perspective on bioenergy sustainability workshop, Oak Ridge, TN (Feb 3-4)

(61) Warren, JM, RJ Norby, BE Medlyn. 2010. "Elevated CO_2 initially stimulates photosynthesis in sweetgum, but effects dissipate after a decade." *Poster*, Annual meeting of the Ecological Society of America, Pittsburgh, PA.

(62) Warren, JM, J Childs, C Gunderson, P Hanson, S Wullschleger. 2011. "Ecophysiology of woody plants in an ombrotrophic spruce bog – potential impacts with climate change." *Oral*, Annual meeting of the Ecological Society of America, Austin, TX.

(63) Warren, JM, H Bilheux, M Kang, S Voisin, C Cheng, J Horita, E Perfect, L Walker. 2011. "Neutron imaging reveals internal plant hydraulic dynamics." *Oral,* Fall Meeting of the American Geophysical Union, San Francisco, CA.

(64) Warren, JM, CM Iversen, J Mao, RJ Norby, DM Ricciuto, PE Thornton. 2012. "PiTS – Partitioning in Trees and Soils - GPP field manipulations to interrogate model performance." *Poster,* DOE-BER Terrestrial Ecosystem Science PI Meeting, Washington, DC.

(65) Warren, JM, S Wullschleger, J Childs, C Gunderson, P Hanson, R Kolka. 2012. "Physiological Response of a Boreal Forest to increased T and CO_2 - gas exchange and water relations at the SPRUCE project" *Poster,* DOE-BER Terrestrial Ecosystem Science PI Meeting, Washington, DC.

(66) Warren, JM, CM Iversen, J Mao, RJ Norby, DM Ricciuto, PE Thornton. 2013. "Partitioning in Trees and Soils (PiTS): A field research facility for testing dynamic carbon partitioning representations within global models." *Poster*, Annual meeting of the Ecological Society of America, Minneapolis, MN.

(67) Warren, JM, J Childs, A Jensen, D Weston, S Wullschleger. 2014. "Plant water relations at the SPRUCE S1 ombrotrophic bog – current status of partitioning among components." *Poster,* Climate Change Science Institute Science Advisory Board, Oak Ridge, TN.

(68) Warren, JM, J Childs, A Jensen, D Weston, S Wullschleger. 2014. "Plant water relations in a spruce – sphagnum bog (to be) subjected to climate change treatments." *Oral,* Mer Bleue Peatland Workshop, Montreal, Canada.

(69) Warren, JM, J Childs, A Jensen, D Weston, S Wullschleger. 2014. "Plant water relations in an ombrotrophic bog - scaling water use from sphagnum to spruce under climate change treatments." *Oral,* 2014 International Symposium on Evapotranspiration: Challenges in Measurement and Modeling from Leaf to the Landscape Scale and Beyond, Raleigh, NC.

(70) Warren, JM, J Childs, DJ Weston, AM Jensen, SD Wullschleger. 2014. "Plant water relations at the SPRUCE S1 ombrotrophic bog – partitioning water use and stress tolerance among components." *Poster*, DOE-BER Terrestrial Ecosystem Science PI Meeting, Washington, DC.

(71) Warren, JM, CM Iversen, RJ Norby, J Labbe, J Mao, JAM Moore, DM Ricciuto, PE Thornton. 2014. "^{13}C pulse labeling to assess C partitioning in dogwood – from foliage to fungi." *Oral*, Annual meeting of the Ecological Society of America, Sacramento, CA.

(72) Warren, JM, AM Jensen, S Wullschleger, P Hanson. 2016. "Ecophysiology and water relations of woody plants within an *Picea-Sphagnum* ombrotrophic bog." *Poster*, DOE-BER Terrestrial Ecosystem Science PI Meeting, Potomac, MD.

(73) Warren, JM, J Childs, EJ Ward, S Wullschleger, P Hanson. 2016. "Tipping a SPRUCE tree over - how extreme heat and desiccation may push southern boreal species beyond their capacity." *Poster*, Fall Meeting of the American Geophysical Union, San Francisco, CA.

(74) Warren, JM. 2016. "Highlights from the SPRUCE Project: Initial results from an Ecosystem-scale Warming and Elevated-CO_2 Manipulation in a Northern Peatland." *Oral,* Fall Meeting of the American Geophysical Union, San Francisco, CA.

(75) Warren, JM, EJ Ward, SD Wullschleger, PJ Hanson. 2017. "SPRUCE Ecophysiology - Increased temperature shifts seasonal growth and hydraulic stress in a southern boreal forested bog – how species-specific responses may lead to changes in ecosystem structure and function" *Poster,* Annual meeting of the Ecological Society of America, Portland, OR.

(76) Warren, JM, EJ Ward, SD Wullschleger, PJ Hanson. 2017. "Increased transpiration and plant water stress in a black spruce bog exposed to whole ecosystem warming." *Oral,* Fall Meeting of the American Geophysical Union, New Orleans, LA.

(77) Warren, JM, EJ Ward, J Childs, A Guha, P Hanson. 2018. "Divergent morphological and hydrological responses of dominant woody bog species to whole ecosystem warming and

elevated CO_2 at SPRUCE." *Poster,* DOE-BER Environmental System Science PI Meeting, Potomac, MD.

(78) Warren JM, H Bilheux, K DeCarlo, E Perfect, K Marcacci, C Ficken, JA Hogan. 2019. "Root function - process-level studies focused on mycorrhizae, drought, temperature and neutron imaging." *Poster*, DOE-TES-Science Focus Area at ORNL. Duluth, MN.

(79) Warren, JM, M Dusenge, A King, D Ricciuto, E Ward, D Way, S Wullschleger, PJ Hanson. 2019. "Whole ecosystem warming induces divergent ecophysiological responses in co-occurring boreal tree and shrub species – observations and model simulations." *Poster*, DOE-BER Environmental System Science PI Meeting, Potomac, MD.

(80) Warren, JM, G Spanner, B Gimenez, N Higuchi, AC Araujo, S Ferreira, BD Newman, V Menezes, J Rodrigues, J Chambers, RI Negron-Juarez. 2019. "Trait-specific seasonal shifts in tropical tree water use and soil water extraction patterns in the Central Amazon." *Poster*, Fall Meeting of the American Geophysical Union, San Francisco, CA.

(81) Sebestyen SD, N Griffiths, PJ Hanson, JM Warren, X Shi, DM Ricciuto, J Mao, J Graham, CM Iversen, L Gu, R Kolka. 2019. "Water science objectives and water budget quantification in the SPRUCE experiment." *Poster*, Fall Meeting of the American Geophysical Union, San Francisco, CA.

(82) Warren, JM, M Mayes, P Thornton, S Wullschleger, in collaboration with D Allen, L Hutyra, J Whetstone, D Stover. Accounting for carbon and energy edge effects in forest boundaries: A collaboration with ORNL, NIST, and Boston University." *Poster*, 2020 ESS PI Meeting, Bethesda, MD. (cancelled)

(83) Warren JM, H Bilheux, K DeCarlo, E Perfect, K Marcacci, JA Hogan. 2020. "Root function - process-level studies focused on mycorrhizae, drought, temperature and neutron imaging." *Poster*, 2020 ESS PI Meeting, Bethesda, MD. (cancelled)

Publications and Data Sets (*student, **corresponding author)

(1) Warren JM, HL Allen and FL Booker. 1999. Mineral nutrition, resin flow and phloem phytochemistry in loblolly pine. *Tree Physiology* 19: 655-663.

(2) Warren JM, JH Bassman and S Eigenbrode. 2002. Leaf chemical changes induced in *Populus trichocarpa* Torr. & Gray by enhanced UV-B radiation and concomitant effects on herbivory by *Chrysomela scripta* Fab. (Coleoptera: Chrysomelidae). *Tree Physiology* 22: 1137-1146.

(3) Warren JM, JH Bassman, DS Mattinson, JK Fellman, GE Edwards and R Robberecht. 2002. Alteration of foliar flavonoid composition induced by enhanced UV-B radiation in *Pinus ponderosa, Quercus rubra* and *Pseudotsuga menziesii. Journal of Photochemistry and Photobiology B: Biology* 66: 125-133.

(4) Drobot S, D Porinchu, K Arzayus, V Barber, L Delissio, L M Smith and JM Warren. 2003. The 'ideal' climate change Ph.D. program. DISCCRS I. Dissertations initiative for the advancement of climate change research working group. *http://www.disccrs.org/reports/disccrsclimatechange.pdf*

(5) Warren JM, JH Bassman, JK Fellman, DS Mattinson and S Eigenbrode. 2003. Ultraviolet-B radiation alters phenolic salicylate and flavonoid composition of *Populus trichocarpa* leaves. *Tree Physiology* 23: 527-535.

(6) Meinzer FC, JR Brooks, S Bucci, G Goldstein, FG Scholz and JM Warren. 2004. Converging patterns of uptake and hydraulic redistribution of soil water in contrasting woody vegetation types. *Tree Physiology* 24:919-928.

(7) Domec J-C, JM Warren, FC Meinzer, JR Brooks and R Coulombe. 2004. Native root xylem embolism and stomatal closure in stands of Douglas-fir and ponderosa pine: mitigation by hydraulic redistribution. *Oecologia* 141:7-16.

(8) Meinzer FC, BJ Bond, JM Warren and DR Woodruff. 2005. Does water transport scale universally with tree size? *Functional Ecology* 19:558-565.

(9) Warren JM, FC Meinzer, JR Brooks and J-C Domec. 2005. Vertical stratification of soil water storage and release dynamics in Pacific Northwest coniferous forests. *Agricultural and Forest Meteorology* 130:39-58.

(10) Brooks JR, FC Meinzer, JM Warren, J-C Domec and R Coulombe. 2006. Hydraulic redistribution in a Douglas-fir forest: Lessons from system manipulations. *Plant, Cell and Environment* 29:138-150. *Received an EPA Scientific and Technological Achievement Award (STAA Level III).*

(11) Meinzer FC, JR Brooks, J-C Domec, BL Gartner, JM Warren, D Woodruff, K Bible and DC Shaw. 2006. Dynamics of water transport and storage in conifers studied with deuterium and heat tracing techniques. *Plant, Cell and Environment* 29:105-114.

(12) Warren JM, FC Meinzer, JR Brooks, J-C Domec and R Coulombe. 2007. Hydraulic redistribution of soil water in two old-growth coniferous forests: quantifying patterns and controls. *New Phytologist* 173:753-765.

(13) Meinzer FC, JM Warren, JR Brooks. 2007. Species-specific partitioning of soil water resources in an old-growth Douglas-fir/western hemlock forest. *Tree Physiology* 27:871-880.

(14) Woodruff DR, KA McCulloh, JM Warren, FC Meinzer, BL Gartner. 2007. Impacts of tree height on leaf hydraulic architecture and stomatal control in Douglas-fir. *Plant, Cell and Environment* 30:559-569.

(15) Warren JM, JR Brooks, FC Meinzer, JL Eberhart. 2008. Hydraulic redistribution of water from *Pinus ponderosa* trees to seedlings: evidence for an ectomycorrhizal pathway *New Phytologist* 178: 382–394.

(16) Domec J-C, BL Lachenbruch, FC Meinzer, D Woodruff, JM Warren, KA McCulloh. 2008. Maximum height in a conifer is associated with conflicting requirements for xylem design. *PNAS* 105:12069-12074.

(17) Domec J-C, JM Warren, FC Meinzer, BL Lachenbruch. 2009. Safety factors for xylem failure by implosion and air-seeding within roots, trunks and branches of young and old conifer trees. *IAWA Journal* 30:100-120.

(18) Bilheux HZ, J Horita, JM Warren, E Perfect, M Kang. 2010. Neutron imaging of fluids in plant-soil-rock systems using the ORNL/HFIR CG-1 beamline. Goldschmidt Conference Abstract. *Geochimica et Cosmochimica Acta* 74(12) Supplement: A91

(19) Hanson PJ, KW Childs, SD Wullschleger, JS Riggs, WK Thomas, DE Todd, JM Warren. 2011. A method for experimental heating of intact soil profiles for application to climate change experiments *Global Change Biology* 17:1083-1096.

(20) Norby RJ, JM Warren, CM Iversen, BE Medlyn, RE McMurtrie. 2010. CO_2 enhancement of forest productivity constrained by limited nitrogen availability. *PNAS* 107: 19368-19373.

(21) Warren JM, E Pötzelsberger*, SD Wullschleger, PE Thornton, H Hasenauer, RJ Norby. 2011. Ecohydrologic impact of reduced stomatal conductance in forests exposed to elevated CO_2. *Ecohydrology* 4:196-210.

(22) Warren JM, RJ Norby, SD Wullschleger. 2011. Elevated CO_2 enhances leaf senescence during extreme drought in a temperate forest. *Tree Physiology* 31:117-130.

(23) Warren JM, JR Brooks, MI Dragila, FC Meinzer. 2011. *In situ* separation of root hydraulic redistribution of soil water from liquid and vapor transport. *Oecologia* 166:899–911.

(24) Cheng CL, M Kang*, E Perfect, HZ Bilheux, J Horita, S Voisin, JM Warren, DS Hussey. 2012. Average Soil Water Retention Curves Measured by Neutron Radiography. *Soil Science Society of America Journal* 76:1184–1191.

(25) Warren JM, CM Iversen, CT Garten Jr, RJ Norby, J Childs, D Brice, RM Evans, L Gu, P Thornton, DJ Weston. 2012. Timing and magnitude of C partitioning through a young loblolly pine (*Pinus taeda* L.) stand using ^{13}C labeling and shade treatments. *Tree Physiology* 32:799-813.

(26) Kang M*, HZ Bilheux, S. Voisin, CL Cheng, E Perfect, J Horita, JM Warren. 2013. Water calibration measurements for neutron radiography: application to water content quantification in porous media. *Nuclear Instruments and Methods in Physics Research* 708:24-31.

(27) Warren JM, H Bilheux, M Kang*, S Voisin, C Cheng, J Horita, E Perfect. 2013. Neutron imaging reveals internal plant water dynamics. *Plant and Soil* 366:683-693.

(28) De Kauwe MG, BE Medlyn, S Zaehle, AP Walker, MC Dietze, T Hickler, AK Jain, Y Luo, WJ Parton, C Prentice, B Smith, PE Thornton, S Wang, Y-P Wang, D Wårlind, ES Weng, KY Crous, DS Ellsworth, PJ Hanson, H Seok-Kim, JM Warren, R Oren, RJ Norby. 2013. Forest water use and water use efficiency at elevated CO_2: a model-data intercomparison at two contrasting temperate forest FACE sites. *Global Change Biology* 19:1759-79.

(29) Kang M,* E Perfect, CL Cheng, HZ Bilheux, M Gragg, DM Wright, JM Lamanna, J Horita, JM Warren. 2013. Diffusivity and sorptivity of Berea sandstone estimated using neutron radiography. *Vadose Zone Journal* (10.2136/vzj2012.0135).

(30) Warren JM, CM Iversen, CT Garten Jr, RJ Norby, J Childs, D Brice, RM Evans, L Gu, P Thornton, DJ Weston. 2013. PiTS-1: Carbon partitioning in loblolly pine after 13C labeling and shade treatments. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A.
Dataset: http://dx.doi.org/10.3334/CDIAC/ornlsfa.001

(31) Warren JM, H Bilheux, CL Cheng, E Perfect. 2013. Reply to: Comment on 'neutron imaging reveals internal plant water dynamics. *Plant and Soil* 371:15–17.

(32) Sun Y, L Gu, RE Dickinson, SG Pallardy, J Baker, Y Cao, FM DaMatta, X Dong, D Ellsworth, D Van Goethem, AM Jensen, BE Law, R Loos, SC Vitor Martins, RJ Norby, J Warren, D Weston, K Winter. 2013. Asymmetrical effects of mesophyll conductance on fundamental photosynthetic parameters and their relationships estimated from leaf gas exchange measurements. *Plant Cell Environment* 37: 978–994. doi: 10.1111/pce.12213

(33) Kang M, E Perfect, CL Cheng, HZ Bilheux, J Lee, J Horita, JM Warren. 2014. Multiple Pixel-Scale Water retention curves quantified by neutron radiography. *Advances in Water Resources* 65:1-8.

(34) Iversen CM, Sloan VL, Sullivan PF, Euskirchen ES, McGuire AD, Norby RJ, Walker AP, Warren JM, Wullschleger SD. 2014. Plant roots in arctic tundra.
Dataset: http://dx.doi.org/10.5440/1114222

(35) Walker AP, PJ Hanson, MG De Kauwe, BE Medlyn, S Zaehle, S Asao, M Dietze, T Hickler, C Huntingford, CM Iversen, A Jain, M Lomas, Y Luo, H McCarthy, WJ Parton, IC Prentice, PE Thornton, S Wang, Y-P Wang, D Warlind, E Weng, JM Warren, FI Woodward, R Oren, RJ Norby. 2014. Comprehensive ecosystem model-data synthesis using multiple data sets at two temperate forest free-air CO2 enrichment experiments: Model performance at ambient CO_2 concentration. *Journal of Geophysical Research – Biogeosciences* 119: 937-964.

(36) De Kauwe MG, BE Medlyn, S Zaehle, AP Walker, S Asao, MC Dietze, B El-Masri, T Hickler, AK Jain, Y Luo, WJ Parton, C Prentice, B Smith, PE Thornton, S Wang, Y-P Wang, D Wårlind, ES Weng, P Hanson, C Iversen, HR McCarthy, JM Warren, R Oren, RJ Norby. 2014. Where does the carbon go? A model-data intercomparison of carbon allocation at two temperate forest free-air CO2 enrichment sites. *New Phytologist* 203: 883–899.

(37) Bailey V, P.J. Hanson, J. Jastrow, M. Torn, D. Stover, et al. 2014. Data-Model Needs for Belowground Ecology. A summary report from the DOE Terrestrial Ecosystem Sciences Mini-Workshop. May 8, 2014. 40pp.

(38) Iversen CM, VL Sloan, PF Sullivan, ES Euskirchen, AD McGuire, RJ Norby, AP Walker, JM Warren, SD Wullschleger. 2015. *Tansley Review* - The unseen iceberg: Plant roots in arctic tundra. *New Phytologist* 205:34-58.

(39) Warren JM, PJ Hanson, CM Iversen, J Kumar, AP Walker, SD Wullschleger. 2015. *Tansley Review* Root structural and functional dynamics in terrestrial biosphere models – evaluation and recommendations. *New Phytologist* 205:59-78.

(40) Weston DJ, CM Timm, AP Walker, L Gu, W Muchero, J Schmutz, JA Shaw, GA Tuskan, JM Warren, SD Wullschleger D. 2015. Sphagnum physiology in the context of changing climate:

Emergent influences of genomics, modeling and host-microbiome interactions on understanding ecosystem function. *Plant Cell and Environment* 38:1737-1751.

(41) Kim K*, N Labbé, JM Warren, T Elder, TG Rials. 2015. Chemical and anatomical changes in *Liquidambar styraciflua* L. xylem after long term exposure to elevated CO_2. *Environmental Pollution* 198:179-185.

(42) Lin Y-S, et al. 2015. Optimal stomatal behaviour around the world: synthesis of a global stomatal conductance database *Nature Climate Change* 5:459-464.

(43) Warren JM, AM Jensen, BE Medlyn, RJ Norby, DT Tissue. 2015. CO_2 stimulation of photosynthesis in *Liquidambar styraciflua* is not sustained during a 12-year field experiment. *AoB Plants 7: plu074; doi:10.1093/aobpla/plu074*

(44) Wullschleger SD, JM Warren, PE Thornton. 2015. Leaf respiration (*GlobResp*) – global trait database supports Earth System Models – Commentary. *New Phytologist* 206: 483-485.

(45) Jensen AM, JM Warren, PJ Hanson, J Childs, SD Wullschleger. 2015. Needle age and season influence photosynthetic temperature response in mature *Picea mariana* trees. *Annals of Botany* 116(5):821-832. *doi: 10.1093/aob/mcv115*

(46) Eberhardt TL, N Labbé, C-L So, K Kim, KG Reed, D Leduc, JM Warren. 2015. Effects of long-term elevated CO_2 treatment on the inner and outer bark chemistry of sweetgum (*Liquidambar styraciflua* L.) trees. *Trees – Structure and Function* 29:1735–1747. *doi:10.1007/s00468-015-1254-8*

(47) Medlyn, B., Zaehle, S., De Kauwe, M. et al. 2015. Using ecosystem experiments to improve vegetation models. Nature Climate Change 5, 528–534 (2015). https://doi.org/10.1038/nclimate2621

(48) Jensen AM, JM Warren, PJ Hanson, J Childs and SD Wullschleger. 2015. Dataset: SPRUCE S1 Bog Pretreatment Photosynthesis and Respiration for Black Spruce: 2010-2013. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. http://dx.doi.org/10.3334/CDIAC/spruce.007

(49) Eberhardt TL, C-L So, D Leduc, N Labbé, JM Warren. 2016. Changes in bark composition from long-term elevated CO_2 treatment: implications for the management of sweetgum as a wood energy crop. In: Proceedings of the 18th Biennial Southern Silvicultural Research Conference. Schweitzer, CJ, Clatterbuck, WK, Oswalt, Christopher M., eds. e–Gen. Tech. Rep. SRS–XXX. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station.

(50) Mao J, DM Ricciuto, PE Thornton, JM Warren, AW King, X Shi, CM Iversen, RJ Norby. 2016. Evaluating the Community Land Model in a pine stand with shading manipulations and $^{13}CO_2$ labeling. *Biogeosciences* 13:641-657. *doi:10.5194/bg-13-641-2016*

(51) Gu L, RJ Norby, IC Haworth, AM Jensen, BL Turner, AP Walker, JM Warren, DJ Weston, K Winter. 2016. Dataset: Photosynthetic parameters and nutrient content of trees at the Panama crane sites. *doi:10.15486/NGT/1255260*

(52) Johnson DM, R Wortemann, KA McCulloh, L Jordan-Meille, E Ward, JM Warren, S Palmroth, JC Domec. 2016. A test of the hydraulic vulnerability segmentation hypothesis in angiosperm and conifer tree species. *Tree Physiology* 36:983-993. *doi:10.1093/treephys/tpw031*

(53) Norby RJ, L Gu, IC Haworth, AM Jensen, BL Turner, AP Walker, JM Warren, DJ Weston, K Winter et al. 2016. Informing models through empirical relationships between foliar phosphorus, nitrogen and photosynthesis across diverse woody species in Panama. 2016. *New Phytologist* (*in press). doi:10.1111/nph.14319*

(54) Xu Y*, D Wang, CM Iversen, A Walker, J Warren. 2017. Building a virtual ecosystem dynamic model for root research. *Environmental Modelling & Software* 89:97-105.

(55) Hanson PJ, Riggs JS, Nettles WR, Phillips JR, Krassovski MB, Hook LA, Richardson AD, Ricciuto DM, Warren JM, Barbier C. 2017. Attaining whole-ecosystem warming using air and deep soil heating methods with an elevated CO_2 atmosphere. *Biogeosciences* 14:861–883, doi: 10.5194/bg-14-861-2017

(56) Phillips JR, DJ Brice, PJ Hanson, J Childs, CM Iversen, RJ Norby, JM Warren. 2017. Dataset: SPRUCE Pretreatment Plant Tissue Analyses, 2009 through 2013. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. http://dx.doi.org/10.3334/CDIAC/spruce.038

(57) Griffiths, N. A., P. J. Hanson, D. M. Ricciuto, C. M. Iversen, A. M. Jensen, A. Malhotra, K. J. McFarlane, R. J. Norby, K. Sargsyan, S. D. Sebestyen, X. Shi, A. P. Walker, E. J. Ward, J. M. Warren, and D. J. Weston. 2017. Temporal and Spatial Variation in Peatland Carbon Cycling and Implications for Interpreting Responses of an Ecosystem-Scale Warming Experiment. Soil Sci. Soc. Am. J. 0. *https://doi.org/10.2136/sssaj2016.12.0422*

(58) Christianson DS, C Varadharajan, B Christoffersen, M Detteo, B Faybishenko, KJ Jardine, R Negron-Juarez, BO Gimenez, GZ Pastorello, TL Powell, JM Warren, BT Wolfe, JQ Chambers, LM Kueppers, NG McDowell, D Agarwal. 2017. A metadata reporting framework (FRAMES) for synthesis of earth system observations. *Ecological Informatics* 42:148-158 *https://doi.org/10.1016/j.ecoinf.2017.06.002*

(59) Dhiman I, H Bilheux, K DeCarlo, SL Painter, L Santodonato, JM Warren**. 2018. Quantifying root water extraction after drought recovery using sub-mm in situ empirical data. *Plant and Soil* 424:73-89. *https://doi.org/10.1007/s11104-017-3408-5*- Highlighted on BER structural biology website: https://www.berstructuralbioportal.org/

(60) Richardson AD, K Hufkens, T Milliman, DM Aubrecht, ME Furze, B Seyednasrollah, MB Krassovski, JM Latimer, WR Nettles, RR Heiderman, JM Warren, PJ Hanson. 2018. Ecosystem warming extends vegetation activity but heightens vulnerability to cold temperatures. *Nature* 560, 368–371.

(61) Richardson, A.D., J.M. Latimer, W.R. Nettles, J.M. Warren, and P.J. Hanson. 2017. SPRUCE Ground Observations of Phenology in Experimental Plots, Spring 2016. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. http://dx.doi.org/10.3334/CDIAC/spruce.044

(62) McDowell, N., Allen, C.D., Anderson-Teixeira, K., Brando, P., Brienen, R., Chambers, J., Christoffersen, B., Davies, S., Doughty, C., Duque, A., Espirito-Santo, F., Fisher, R., Fontes, C.G., Galbraith, D., Goodsman, D., Grossiord, C., Hartmann, H., Holm, J., Johnson, D.J., Kassim, A.R., Keller, M., Koven, C., Kueppers, L., Kumagai, T., Malhi, Y., McMahon, S.M., Mencuccini, M., Meir, P., Moorcroft, P., Muller-Landau, H.C., Phillips, O.L., Powell, T., Sierra, C.A., Sperry, J., Warren, J., Xu, C. and Xu, X. (2018), Drivers and mechanisms of tree mortality in moist tropical forests. *New Phytologist* 219: 851-869. https://doi.org/10.1111/nph.15027

(63) Guha A, C Cummings*, J Han*, DA McLennan, JM Warren. 2018. Differential ecophysiological responses and resilience to heat wave events in four co-occurring temperate tree species. Invited for special issue "Focus on Tree Mortality in a Warming World: Causes, Patterns, and Implications." Environmental Research Letters https://doi.org/10.1088/1748-9326/aabcd8

(64) Ossler F, LJ Santodonato, JM Warren, CAE Finney, J-C Bilheux, RA Mills, HD Skorpenske, HZ Bilheux. 2019. In situ monitoring of hydrogen loss during pyrolysis of wood by neutron radiography. *Proceedings of the Combustion Institute 37:1273-1280*

(65) Furze M*, A Jensen, J Warren, A Richardson. 2018. Seasonal patterns of nonstructural carbohydrate reserves in four woody boreal species. *Journal of the Torrey Botanical Society 145:332-340.*

(66) Furze ME*, AM Jensen, JM Warren, AD Richardson. 2018. Dataset: SPRUCE S1 Bog Seasonal Patterns of Nonstructural Carbohydrates in *Larix, Picea, Rhododendron, and Chamaedaphne*, 2013. Oak Ridge National Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. https://doi.org/10.25581/spruce.037/1473917

(67) Hanson, P.J., J.R. Phillips, Stan D. Wullschleger, W. Robert Nettles, Jeffrey M. Warren, Eric J. Ward, Jake D. Graham 2018. Dataset: SPRUCE Tree Growth Assessments of Picea and Larix in S1-Bog Plots and SPRUCE Experimental Plots beginning in 2011. Oak Ridge National

Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. https://doi.org/10.25581/spruce.051/1433836

(68) Walker, A.P., De Kauwe, M.G., Medlyn, B.E. et al. 2019. Decadal biomass increment in early secondary succession woody ecosystems is increased by CO2 enrichment. *Nature Communications* 10, 454. https://doi.org/10.1038/s41467-019-08348-1

(69) Jensen AM, Warren JM, Hook LA, Wullschleger SD, Brice DJ, Childs J, Vander Stel HM. 2018. Dataset: SPRUCE S1 Bog Pretreatment Seasonal Photosynthesis and Respiration of Trees, Shrubs, and Herbaceous Plants, 2010-2015. Oak Ridge National Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. https://doi.org/10.3334/CDIAC/spruce.008

(70) Jensen AM, JM Warren, AW King, DM Ricciuto, P Hanson, Stan Wullschleger. 2019. Simulated projections of boreal forest peatland ecosystem productivity are sensitive to observed seasonality in leaf physiology. *Tree Physiology* 39, 556-572.

(71) Kumarathunge, D.P., Medlyn, B.E., Drake, J.E., Tjoelker, M.G., Aspinwall, M.J., Battaglia, M., Cano, F.J., Carter, K.R., Cavaleri, M.A., Cernusak, L.A., Chambers, J.Q., Crous, K.Y., De Kauwe, M.G., Dillaway, D.N., Dreyer, E., Ellsworth, D.S., Ghannoum, O., Han, Q., Hikosaka, K., Jensen, A.M., Kelly, J.W.G., Kruger, E.L., Mercado, L.M., Onoda, Y., Reich, P.B., Rogers, A., Slot, M., Smith, N.G., Tarvainen, L., Tissue, D.T., Togashi, H.F., Tribuzy, E.S., Uddling, J., Vårhammar, A., Wallin, G., Warren, J.M. and Way, D.A. 2019. Acclimation and adaptation components of the temperature dependence of plant photosynthesis at the global scale. New Phytologist 222: 768-784. https://doi.org/10.1111/nph.15668

(72) Gimenez BO*, KJ Jardine, N Higuchi, RI Negrón-Juárez, I Sampaio-Filho, L Cobello, C Fontes, T Dawson, C Varadharajan, DS Christianson, AC Araújo, JM Warren, BD Newman, JA Holm, CD Koven, NG McDowell, JQ Chambers. 2019. Species-Specific Shifts in Diurnal Sap Velocity Dynamics and Hysteretic Behavior of Ecophysiological Variables During the 2015–2016 El Niño Event in the Amazon Forest. *Frontiers in Plant Sciences* 10: 830

(73) Ficken CD*, JM Warren. 2019. The carbon economy of drought: comparing respiration responses of roots, mycorrhizal fungi, and free-living microbes to an extreme dry-rewet cycle. *Plant and Soil* 435: 407. https://doi.org/10.1007/s11104-018-03900-2

(74) Grossiord C, B Christoffersen, K Anderson-Teixeira, CZ Berry, C Baraloto, D Bonal, I Borrego, JQ Chambers, DS Chistianson, M Detto, B Faybishenko, C Fortunel, BO Gimenez, KJ Jardine, L Kueppers, GW Moore, R Negron-Juarez, C Stahl, C Varadharajan, JM Warren, B Wolfe, L Wei, C Xu, NG McDowell. 2019. Precipitation mediates sap flux sensitivity to evaporative demand in the neotropics. *Oecologia 191: 519–530.*

(75) Ward, EJ, JM Warren, DA McLennan, ME Dusenge, D Way, SD Wullschleger, PJ Hanson. 2019. Photosynthetic and respiratory responses of two bog shrub species to whole ecosystem warming and elevated CO2 at the boreal-temperate ecotone. *Frontiers in Plant Sciences 2 (54): 1-14.* https://doi:10.3389/ffgc.2019.00054

(76) Ward EJ, Warren JM, McLennan D, Wullschleger SD. 2019. Dataset: SPRUCE Photosynthesis and Respiration of *Rhododendron groenlandicum* and *Chamaedaphne calyculata* in SPRUCE Experimental Plots, 2016. Oak Ridge National Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. https://doi.org/10.25581/spruce.061/1493603

(77) Dusenge ME*, Stinziano RJ, Warren JM, Ward EJ, Wullschleger SD, Hanson PJ, Way DA. 2018. Dataset: SPRUCE Whole Ecosystem Warming (WEW) Photosynthesis and Respiration of *Picea* and *Larix* in Experimental Plots, 2016. Oak Ridge National Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. https://doi.org/10.25581/spruce.056/1455138

(78) Adams P., et al. 2019. Understanding Complexity in Biological and Environmental Systems Through Neutron Science: Unique Capabilities of Second Target Station Facilitate Scientific Discovery. Oak Ridge National Laboratory Report. March 2019. 50 pp

(79) Adams P., et al. 2019. First Experiments New Science Opportunities at the Spallation Neutron Source Second Target Station (abridged). Oak Ridge National Laboratory Report. March 2019. ORNL Report# ORNL/SPR-2020/1437. 16 pp

(80) Norby RJ, Childs J, Hanson PJ, Warren JM. 2019. Rapid loss of an ecosystem engineer: Sphagnum decline in an experimentally warmed bog. *Ecology and Evolution* 9:12571– 12585. https://doi.org/10.1002/ece3.5722

(81) Wullschleger S, B Davison, M Doktycz, U Kalluri, J Labbe, M Mayes, W Muchero, D Pelletier, E Pierce, G Tuskan, J Warren, X Yang. 2019. Harnessing Plant and Microbial Genomics for Biological Carbon Capture and Storage in Soil. Energy and Environmental Sciences Directorate, Oak Ridge National Laboratory. 14 pp.

(82) Menon, M., Casson, S. A., Warren, J. M., Das, B. S., Mickelbart, M. V., eds. (2019). Water-Use Efficiency: Advances and Challenges in a Changing Climate. Lausanne: Frontiers Media. https://doi:10.3389/978-2-88963-098-1

(83) Warren J. 2020. *Dataset:* Sap flow and Dendrometer Raw Data from 10-2015 to 06-2016 at the Forest Service TRACE project in Sabana, PR. NGEE Tropics Data Collection. Accessed at http://dx.doi.org/10.15486/ngt/1581440

(84) Warren J. 2020. *Dataset:* Sap flow and Dendrometer Metadata from 10-2015 to 06-2016 at the Puerto Rico TRACE Site. NGEE Tropics Data Collection. Accessed at http://dx.doi.org/10.15486/ngt/1581443

(85) Hogan JA*, C Baraloto, CD Ficken, MD Clark, DM Weston, JM Warren. 2020. *Dataset:* Physiological Responses of *Populus trichocarpa* to Warming. Oak Ridge National Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. https://doi.org/10.25581/ornlsfa.018/1617459

(86) Yan B, J Mao, RE Dickinson, PE Thornton, X Shi, DM Ricciuto, JM Warren, FM Hoffman. 2020. Modeling tree stem-water dynamics over an Amazonian rainforest. *Ecohydrology* 13:e2180. https://doi.org/10.1002/eco.2180

(87) Hanson, P. J., Griffiths, N. A., Iversen, C. M., Norby, R. J., Sebestyen, S. D., Phillips, J. R., et al. 2020. Rapid net carbon loss from a whole-ecosystem warmed Peatland. AGU Advances, 1, e2020AV000163. https://doi.org/10.1029/2020AV000163

(88) Negrón-Juárez R, SJF Ferreira, M Crestani Mota, B Faybishenko, MTF Monteiro, LA Candido, RP Ribeiro, RC de Oliveira, AC de Araujo, JM Warren, BD Newman, BO Gimenez, C Varadharajan, D Agarwal, L Borma, J Tomasella, N Higuchi, JQ Chambers. 2020. Measurement and characterization of soil moisture dynamics in a Central Amazonian tropical forest. *Vadose Zone Journal* VZJ 19:e20070. https://doi.org/10.1002/vzj2.20070

(89) Venkatakrishnan S, A Ziabari, J Hinkle, AW Needham, JM Warren, HZ Bilheux. 2020. Convolutional neural network based non-iterative reconstruction for accelerating neutron tomography. *Machine Learning Science and Technology (in press)*

(90) Ossler F, CEA Finney, JM Warren, JC Bilheux, Y Zhang, RA Mills, LJ Santodonato, HZ Bilheux. 2020. Dynamics of hydrogen loss and structural changes in pyrolyzing biomass utilizing neutron imaging. *Carbon (in press)*

(91) Shi X, DR. Ricciuto, PE Thornton, X Xu, F Yuan, RJ Norby, AP Walker, JM Warren, J Mao, PJ Hanson, L Meng. D Weston, NA Griffiths. 2020. Modeling the hydrology and physiology of *Sphagnum* moss in a northern temperate bog. *Biogeosciences (in press)*

(92) Jensen AM, D Ecker, K Carter, M Persson, JM Warren. 2020. Springtime drought shifts carbon partitioning of recent photosynthates in mature *Picea mariana* trees, causing restricted canopy development. *Frontiers in Forests and Global Change* (*in press*).

(93) Bilheux HZ, M Cekanova, JM Warren, MJ Meagher, R Ross, JC Bilheux, S Venkatakrishnan, JYY Lin, Y Zhang, MR Pearson, E Stringfellow. 2020. Neutron radiography and computed tomography of biological systems. *Journal of Visualized Experiments* (*in press*).

(94) Ely KS, A Rogers JA Anderson,…, AP Walker, JM Warren, SD Wullschleger, et. al. 2020. A metadata and data standard for archiving of leaf-level gas exchange data. *Ecological Informatics* (*in press*).