

## Curriculum Vitae Heather R. McCarthy

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Department of Microbiology and Plant Biology  
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### Research Interests:

Physiological Ecology, Global Change, Urban Ecology, Ecohydrology, Elevated CO<sub>2</sub> effects on ecosystems, Spatial Variation in Ecological Processes, Forest Carbon Cycling, Disturbance, Biosphere-Atmosphere Exchange.

### Education:

2007	<b>Ph.D.</b>	Ecology, Duke University
2000	<b>B.S.</b>	Environmental Science, Oregon State University

### Academic Appointments:

2011 –	<b>Assistant Professor</b> (Dept. of Microbiology and Plant Biology, University of Oklahoma)
2007 – 2011	<b>Postdoctoral Researcher</b> (Dept. of Earth System Science, University of California, Irvine)
2000 – 2007	<b>Graduate Research Assistant</b> (Nicholas School of the Environment, Duke University)

### Teaching and Mentoring:

Instructor: University of Oklahoma. Courses: Plant Physiological Ecology (Spring 2013), Principles of Plant Ecology (Fall 2012, 2013), Methods in Plant Ecology (Fall 2012, 2013), Botany Seminar (Spring 2012).

University of California – Irvine. Course: Earth System Science 1 – The Physical Environment (Summer 2009).

Graduate students: University of Oklahoma. Ana Rodriguez (MS, current). Member of 9 additional graduate student committees (completed or in progress).

Undergraduate students: University of Oklahoma. Katrina Pollard (capstone committee chair, spring 2012), Ami Bassett (honors project advisor, current).

University of California – Irvine. Primary mentor for undergraduate researchers in the Biological Sciences Undergraduate Research 199 Program, and the Minority Science Program for increasing participation of underrepresented minority students in science (2007 – 2011).

Teaching Assistant: Duke University, Nicholas School of the Environment and Earth Sciences. Course: Forest Ecosystems. Assisted students, designed field labs and course assignments (Spring 2005).

### Synthesis, Service and Outreach Activities:

University of Oklahoma representative to the Great Plains Cooperative Ecosystem Studies Unit (2012 - present).

Co-organizer, workshop for Biology and Microbiology and Plant Biology graduate students on applying for post-doc and faculty positions. University of Oklahoma, November 12, 2012.

Co-organizer and co-leader “Arbol University” a 5 week field program on urban forest sampling for Los Angeles Conservation Corps students. Summer 2010.

Invited guest presenter for Target Science, a K-12 science teacher program run by the Los Angeles Educational Partnership (2009 – 2010).

Selected participant for: South Central Climate Science Center science workshop. Fort Worth, Texas, November 2012.

OSU FORWARD to Professorship workshop. Stillwater, Oklahoma, March 2012.

Dept. of Energy workshop “Strategies to promote integrated experiment-model approaches to terrestrial ecosystem study”. Bethesda, Maryland, March 2012.

Interdisciplinary workshop “Dissertations Initiative for the Advancement of Climate-Change Research (DISCCRS) V” promoting advancement and collaboration among recent Ph.Ds in climate change research. Mesa, Arizona, March 2010.

Ad hoc reviewer for: National Science Foundation (2009-present).

Reviewer for: Advances in Water Resources, Annals of Applied Biology, Biogeochemistry, Biogeosciences Discussions, Earth Interactions, Ecological Applications, Ecology Letters, Frontiers in Functional Plant Ecology, Global Change Biology, Hydrological Processes, Nature Climate Change, New Phytologist, Oecologia, Plant and Soil, Proceedings of the Oklahoma Biological Survey, Science of the Total Environment, Tree Physiology.

#### **Professional Affiliations:**

Ecological Society of America (Physiological Ecology Section, Urban Ecosystem Ecology Section), American Geophysical Union

#### **Publications (journal articles):**

Avolio ML, Pataki DE, Pincetl S, Gillespie T, Jenerette GD, **McCarthy HR**. Understanding preferences for tree attributes: the relative effects of socio-economic and local environmental factors. *Proceedings of the National Academy of Science, in review*.

Ummenhofer CC, Xu H, Twine TE, Girvetz E, **McCarthy HR**, Chhetri N, Nicholas KA. How climate change affects extremes in maize and wheat yield in two cropping regions. *Journal of Climate, in review*.

Wang H, Zhao P, Zou LL, **McCarthy HR**, Zeng XP, Ni GY, Rao XQ. CO<sub>2</sub> uptake of mature *Acacia mangium* plantation from sap flow measurements and stable carbon isotope discrimination. *Biogeosciences, in review*.

Liang X, Luo X, **McCarthy HR**. VIC+ for Arid Conditions: A Study of Biological and Hydrological Processes and Their Interactions in Soil-Plant-Atmosphere Continuum. *Water Resources Research, in review*.

Oishi AC, Palmroth S, Johnsen KH, **McCarthy HR**, Oren R. Effects of atmospheric [CO<sub>2</sub>], nitrogen availability and soil moisture on the spatial and temporal variation of forest soil CO<sub>2</sub> flux. *Global Change Biology*, in review.

Pataki DE, **McCarthy HR**, Gillespie T, Jenerette GD, Pincetl S (2013). A trait based ecology of the Los Angeles urban forest. *Ecosphere*, **4**, art72, <http://dx.doi.org/10.1890/ES13-00017.1>

Ward EJ, Oren R, Bell DM, Clark JS, **McCarthy HR**, Kim H-S, Domec J-C (2013). The effects of long-term elevated CO<sub>2</sub> and nitrogen fertilization on stomatal conductance estimated from scaled sap flux measurements at Duke FACE. *Tree Physiology*, **33**, 135-151.

Battipaglia G, Saurer M, Cherubini P, Calfapietra C, **McCarthy HR**, Norby RJ, M. Cotrufo MF. (2013). Elevated CO<sub>2</sub> increases tree-level intrinsic water use efficiency: insights from carbon and oxygen isotope analyses across three forest FACE sites. *New Phytologist*, **197**, 544-554.

**McCarthy HR**, Luo Y, Wullschleger SD (2012). Integrating empirical-modeling approaches to improve understanding of terrestrial ecology processes. *New Phytologist*, **195**, 523-525.

Novick KA, Katul GG, **McCarthy HR**, Oren R. (2012). Increased resin flow in mature pine trees growing under elevated CO<sub>2</sub> and moderate soil fertility. *Tree Physiology*, **32**, 752-763.

Litvak E, **McCarthy HR**, Pataki DE. (2012). Transpiration sensitivity of urban trees in a semi-arid climate is constrained by xylem vulnerability to cavitation. *Tree Physiology*, **32**, 373-388.

Bijoor NS, **McCarthy HR**, Zhang D, Pataki DE. (2012). Water sources of urban trees in the Los Angeles metropolitan area. *Urban Ecosystems*, **15**, 194-214.

**McCarthy HR**, Pataki DE, Jenerette GD (2011). Plant water use efficiency as a metric of urban ecosystem services. *Ecological Applications*, **21**, 3115-3127.

Hofmockel KS, Gallet-Budynek A, **McCarthy HR**, Currie WS, Jackson RB, Finzi AC (2011). Sources of increased N uptake in forest trees growing under elevated CO<sub>2</sub>: results of a large-scale <sup>15</sup>N study. *Global Change Biology*, **17**, 3338-3350.

Litvak E, **McCarthy HR**, Pataki DE (2011). Water relations of coast redwood planted in the semi-arid climate of southern California. *Plant, Cell & Environment*, **34**, 1384-1400.

Pataki DE, **McCarthy HR**, Litvak E, Pincetl S. (2011). Transpiration of urban forests in the Los Angeles metropolitan area. *Ecological Applications*, **21**, 661-677.

Drake JE, Gallet-Budynek A, Hofmockel KS, Bernhardt ES, Billings SA, Jackson RB, Johnsen KS, Lichter J, **McCarthy HR**, McCormack ML, Moore DJP, Oren R, Palmroth S, Phillips RP, Phippen JS, Pritchard SG, Treseder KK, Schlesinger WH, DeLucia EH, Finzi AC. (2011). Increases in the flux of carbon belowground stimulates nitrogen uptake and sustains the long-term enhancement of forest productivity under elevated CO<sub>2</sub>. *Ecology Letters*, **14**, 349-357.

Domec J-C, Schäfer, K, Oren R, Kim H-S, **McCarthy HR**. (2010). Variable conductivity and embolism in roots and branches of four contrasting tree species and their impacts on whole-

plant hydraulic performance under future atmospheric CO<sub>2</sub> concentration. *Tree Physiology*, **30**, 1001-1015.

Palmroth S, Katul GG, Hui D, **McCarthy HR**, Jackson RB, Oren R. (2010). Estimation of long-term basin-scale evapotranspiration from streamflow time series. *Water Resources Research*, **46**, W10512, doi:10.1029/2009WR008838.

**McCarthy HR**, Pataki, DE (2010). Drivers of variability in water use of native and non-native urban trees in the greater Los Angeles area. *Urban Ecosystems*, **13**, 393-414.

Way DA, LaDeau SL, **McCarthy HR**, Clark JS, Oren R, Finzi AC, Jackson RB (2010). Greater seed production in elevated CO<sub>2</sub> is not accompanied by reduced seed quality in *Pinus taeda* L. *Global Change Biology*, **16**, 1046-1056.

**McCarthy HR**, Oren R, Johnsen KH, Gallet-Budynek A, Pritchard SG, Cook CW, LaDeau SL, Jackson RB, Finzi AC (2010). Reassessment of plant carbon dynamics at the Duke free air CO<sub>2</sub> enrichment site: interactions of atmospheric [CO<sub>2</sub>] with nitrogen and water availability over stand development. *New Phytologist*, **185**, 514-528.

Song C, Katul G, Oren R, Band LE, Tague CL, Stoy PC, **McCarthy HR** (2009). Energy, water and carbon fluxes in a loblolly pine stand: results from uniform and gappy canopy models with comparisons to eddy flux data. *Journal of Geophysical Research – Biogeosciences*, **114**, G04021, doi:10.1029/2009JG000951.

Juang J-Y, Katul GG, Siqueira MBS, Stoy PC, **McCarthy HR** (2008). Investigating a hierarchy of Eulerian closure models for scalar transfer inside forested canopies. *Boundary-Layer Meteorology*, **128**, 1–32, doi: 10.1007/s10546-008-9273-2.

Stoy PC, Katul GG, Siqueira MBS, Juang J-Y, Novick KA, **McCarthy HR**, Oishi AC, Oren R (2008). Role of vegetation in determining carbon sequestration along ecological succession in the southeastern United States. *Global Change Biology*, **14**, 1409–1427.

**McCarthy HR**, Oren R, Finzi AC, Ellsworth DS, Kim H-S, Johnsen KH, Millar, B (2007). Temporal dynamics and spatial variability in the enhancement of canopy leaf area under elevated atmospheric CO<sub>2</sub>. *Global Change Biology*, **13**, 2479-2497.

**McCarthy HR**, Oren R, Finzi AC, Johnsen KH (2006). Canopy leaf area constrains [CO<sub>2</sub>]-induced enhancement of productivity and partitioning among aboveground carbon pools. *Proceedings of the National Academy of Sciences*, **103**, 19356-19361.

Palmroth S, Oren R, **McCarthy HR**, Johnsen KH, Finzi AC, Butnor JR, Ryan MG, Schlesinger WH (2006). Aboveground sink strength in forests controls the allocation of carbon belowground and its CO<sub>2</sub>-induced enhancement. *Proceedings of the National Academy of Sciences*, **103**, 19362-19367.

Stoy PC, Katul GG, Siqueira MBS, Juang J-Y, **McCarthy HR**, Oishi AC, Uebelherr JM, Kim H-S, Oren R (2006). Separating the effects of climate and vegetation on evapotranspiration along a successional chronosequence in the southeastern U.S. *Global Change Biology*, **12**, 2115-2135.

**McCarthy HR**, Oren R, Kim H-S, Johnsen KH, Maier C, Pritchard SG, Davis MA (2006) Interaction of ice storms and management practices on current carbon sequestration in forests

with potential mitigation under future CO<sub>2</sub> atmosphere. *Journal of Geophysical Research - Atmospheres*, **111**, D15103, doi: 10.1029/2005JD006428.

Siqueira MBS, Katul GG, Sampson DA, Stoy PC, Juang J-Y, **McCarthy HR**, and Oren R (2006) Multi-scale model intercomparisons of CO<sub>2</sub> and H<sub>2</sub>O exchange rates in a maturing southeastern US pine forest. *Global Change Biology*, **12**, 1189-1207.

Oren R, Hsieh C-I, Stoy P, Albertson J, **McCarthy HR**, Harrell P, Katul GG (2006) Estimating the uncertainty in annual net ecosystem carbon exchange: spatial variation in turbulent fluxes and sampling errors in eddy-covariance measurements. *Global Change Biology*, **12(5)**, 883-896.

Juang J-Y, Katul GG, Siqueira MBS, Stoy PC, Palmroth S, **McCarthy HR**, Kim H-S, Oren R (2006) Modeling nighttime ecosystem respiration from measured CO<sub>2</sub> concentration and air temperature profiles using inverse methods. *Journal of Geophysical Research - Atmospheres*, **111**, D08S05, doi:10.1029/2005JD005976.

Finzi AC, Moore DJP, DeLucia, EH, Lichter J, Hofmockel KS, Jackson RB, Kim H-S, **McCarthy HR**, Oren R, Pippen JS, Schlesinger WH (2006) Progressive N limitation of ecosystem processes under elevated CO<sub>2</sub> in a warm-temperature forest. *Ecology*, **87(1)**, 15-25.

Norby RJ, DeLucia EH, Gielen B, Calfapietra C, Giardina CP, King JS, Ledford J, **McCarthy HR**, Moore DJP, Ceulemans R, De Angelis P, Finzi AC, Karnosky DF, Kubiske ME, Lukac M, Pregitzer KS, Scarascia-Mugnozza GE, Schlesinger WH, Oren R (2005) Forest response to elevated CO<sub>2</sub> is conserved across a broad range of productivity. *Proceedings of the National Academy of Sciences*, **102**, 18052-18056.

Stoy PC, Katul GG, Siqueira MBS, Juang J-Y, **McCarthy HR**, Kim H-S, Oishi AC, Oren R (2005) Variability in net ecosystem exchange from hourly to inter-annual time scales at adjacent pine and hardwood forests: a wavelet analysis. *Tree Physiology*, **25**, 887-902.

Katul G, Oren R, McCarthy H, Novick K (2005) Plant hydraulic properties limit photosynthetic capacity and regeneration potential. *Water and the Environment*, **12**, 115.

Palmroth S, Maier CA, **McCarthy HR**, Oishi AC, Kim H-K, Johnsen K, Katul GG, Oren R (2005) Contrasting responses to drought of forest floor CO<sub>2</sub> efflux in a loblolly pine plantation and a nearby oak-hickory forest. *Global Change Biology*, **11**, 421-434.

Oren R, Ellsworth DS, Johnsen KH, Phillips N, Ewers BE, Maier C, Schäfer KVR, **McCarthy H**, Hendrey G, McNulty SG, Katul GG (2001) Soil fertility limits carbon sequestration by forest ecosystems in a CO<sub>2</sub>- enriched atmosphere. *Nature*, **411**, 469-472.

#### **Publications (book chapters):**

Johnsen, KH, Keyser TL, Butnor JR, Gonzalez-Benecke CA, Kaczmarek DJ, Maier CA, **McCarthy HR** and Sun G. Forest productivity and carbon sequestration of forests in the southern United States, in *Climate change adaptation, mitigation and management options*. CRC Press, *in press*.

Katul GG, CG Williams, Siqueira M, Poggi D, Porporato A, **McCarthy H**, and Oren R (2006). Dispersal of Transgenic Conifer Pollen, in *Landscapes, Genomics, and Transgenic Conifers*, ed. Williams CG, Springer Series on Managing Forest Ecosystems, Vol. 9, Chapter 8, pp. 121-146.

**Presentations:**

**McCarthy HR**, Pataki DE, Weller LT. (2012). Patterns of tree water use in the Los Angeles Basin urban forest. In: Biogeochemistry of Green Infrastructure in the Urban Environment. 4<sup>th</sup> International Ecosummit. Columbus, Ohio, October 2012. **(Invited)**

**McCarthy HR**, Pataki DE, Maler G. (2012). Variability in seasonal patterns of water use efficiency and growth of non-native urban tree species in the Los Angeles region using leaf sugars. In: Urban Ecosystems I. Ecological Society of America 97<sup>th</sup> Annual Meeting. Portland, Oregon, August 2012.

**McCarthy HR**, Oren R. (2011). Stand development patterns at the Duke free air CO<sub>2</sub> enrichment site. In: Biogeochemistry: C and N Cycling in Response to Global Change II. Ecological Society of America 96<sup>th</sup> Annual Meeting. Austin, Texas, August 2011.

**McCarthy HR**, Pataki DE, Weller LT, Jenerette GD, Litvak E. (2010). Tree function and ecosystem services in the semiarid Los Angeles Basin urban forest. In: Urban ecosystems as socio-ecological centers of climate change adaptation and mitigation. Ecological Society of America 95<sup>th</sup> Annual Meeting. Pittsburgh, Pennsylvania, August 2010. **(Invited)**.

**McCarthy HR**, Pataki DE, Jenerette GD (2009). Leaf and tree level water use efficiency of urban trees in the Los Angeles Basin. In: Physiology: Plant Respiration and Transpiration II. Ecological Society of America 94<sup>th</sup> Annual Meeting, Albuquerque, New Mexico, August 2009.

**McCarthy HR**, Pataki DE (2007). Drivers of variability in water use of native and non-native urban trees in the greater Los Angeles area. In: Vegetation Controls Over Ecosystem Water Cycling I. 2007 American Geophysical Union Fall Meeting, San Francisco, California, December 2007.

**McCarthy, HR**, Oren R, Johnsen KH, Finzi, AC, Pritchard SG, Jackson RB, Cook CW, Treseder KK (2007). Reassessment of carbon accumulation at the Duke free air CO<sub>2</sub> enrichment site: Interactions of atmospheric [CO<sub>2</sub>] with nitrogen and water availability and stand development. Belowground Processes at the Duke FACE Site: A Ten Year Synthesis of Data & Models. Durham, North Carolina, November 2007.

**McCarthy, HR**, Oren R, Johnsen KH, Finzi, AC, Pritchard SG, Jackson RB, Cook CW, Treseder KK (2007). Reassessment of carbon accumulation at the Duke free air CO<sub>2</sub> enrichment site: Interactions of atmospheric [CO<sub>2</sub>] with nitrogen and water availability and stand development. In: Climate Change and Carbon Cycling II. Ecological Society of America 92<sup>nd</sup> Annual Meeting, San Jose, California, August 2007.

**McCarthy HR** (2006). Increasing the scope of inference of ecosystem response to elevated CO<sub>2</sub>: Exploring the variability beyond the mean at the Duke FACE. Department of Earth Systems Science, University of California, Irvine. October 26, 2006. **(Invited)**.

**McCarthy HR**, Oren R, Kim H-S, Johnsen KH, Maier C, Pritchard SG, Davis MA (2006). Interaction of ice storms and management practices on current carbon sequestration in forests with potential mitigation under future CO<sub>2</sub> atmosphere. Regional Forest Responses to Environmental Change. IUFRO Canopy Processes Working Group. October 2006.

**McCarthy H**, Oren R (2006). Effects of severe ice storms on regional carbon storage in biomass and detrital pools. In: Carbon Cycling II. Ecological Society of America 91st Annual Meeting, Memphis, Tennessee, August 2006.

**McCarthy H**, Oren R, Finzi A, Ellsworth D, Kim H-S, Johnsen K (2005) Temporal dynamics and spatial variability in the enhancement of canopy leaf area under elevated CO<sub>2</sub>. In: Photosynthesis and Water Relations: Leaf Architecture. Ecological Society of America 90th Annual Meeting, Montreal, Canada, August 2005.

**McCarthy H**, Oren R, Johnsen K, Kim H-S (2004) Ice storm impacts on carbon cycling in pine forests under elevated CO<sub>2</sub>, nutrients and thinning. In: Disturbance Ecology I: Scaling, Wind, and Ice. Ecological Society of America 89th Annual Meeting, Portland, Oregon, August 2004.

**McCarthy H**, Millar B, Oren R (2003) Drought sensitivity of growth in a pine forest under CO<sub>2</sub> enrichment and differing nutrient supplies. In: Forest Ecology III: Modeling; Nutrient Cycling. Ecological Society of America 88th Annual Meeting. Savannah, Georgia, August 2003.

**McCarthy H**, Palmroth S, Oren R, Schäfer KVR (2002) Effects of elevated CO<sub>2</sub> and nutrient supplies on carbon allocation in a pine forest. In: Elevated CO<sub>2</sub>. Ecological Society of America 87th Annual Meeting. Tucson, Arizona, August 2002.

**McCarthy HR**, Oren R (2001) Interaction effects of CO<sub>2</sub> and nutrient supplies on water use in a pine forest. American Geophysical Union Fall Meeting, San Francisco, California, December 2001.

#### **Posters:**

**McCarthy HR**, Pataki DE, Weller LT, Jenerette GD (2010). Climatic influences on the spatial distribution of ecosystem services and costs in the Los Angeles urban forest. In: New challenges for ecohydrology and water quality investigations at the watershed scale. 2010 American Geophysical Union Fall Meeting, San Francisco, California, December 2010.

Maler G\*, **McCarthy HR**, Pataki DE. (2010). Seasonal patterns in water use efficiency of urban tree species in southern California. Annual Biomedical Research Conference for Minority Students, Charlotte, North Carolina, November 2010.

**McCarthy HR**, Pataki DE, Litvak E (2009). The role of planted forests in urban water budgets. In: Ecohydrological Studies in Urban Environments. 2009 American Geophysical Union Fall Meeting, San Francisco, California, December 2009 (**Invited**).

Jaimes J\*, **McCarthy HR**, Pataki DE (2009). Using carbon isotopes to study the water-use efficiency of tree species in Southern California. Annual Biomedical Research Conference for Minority Students, Phoenix, Arizona, November 2009.

**McCarthy HR**, Jenerette GD, Pataki DE (2008). Toward a predictive model for water and carbon fluxes of non-native trees in urban habitats. In: Urban Areas and Global Change II. 2008 American Geophysical Union Fall Meeting, San Francisco, California, December 2008.

**McCarthy HR**, Pataki DE (2008). Water use and hydraulics of native and non-native urban trees in the greater Los Angeles area. Structure and Function of Plant Hydraulic Systems Workshop. Fullerton, California, March 2008.

**McCarthy H**, Palmroth S, Kim H-S, Oren R (2005). Summer and Winter Precipitation: Effects on Carbon Sequestration and Timber Production under Current and Future Atmospheric [CO<sub>2</sub>]. U.S. Climate Change Science Program (CCSP) Workshop, November 2005.

**McCarthy H**, Van Horne M, McNulty S, Phillips N, Bond BJ (2000). Seasonal and radial variation in sapflow of riparian red alder. In: Water Relations. Ecological Society of America 85th Annual Meeting. Snowbird, Utah, August 2000.

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