JAMES H. RICHARDS, Ph.D.

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Major research expertise

Plant physiological ecology, plant stress physiology, plant-soil interrelationships, plant adaptation to stressful environments, local adaptation and phenotypic plasticity of plants, application of plant physiological ecology and stress physiology to restoration in severe environments

Professional preparation

Utah State University, Logan, UT, USA	Plant Physiological Ecology	Postdoc	1980-1982
University of Alberta, Edmonton, Canada	Botany-Plant Ecology	Ph.D.	1981
California Institute of Technology, Pasadena, CA, USA	Biology	B.S.	1970

Appointments

2014 – present	Principal Plant Ecophysiologist, Plantierra LLC & Professor Emeritus, LAWR
1995 – 2014	Professor, Land, Air & Water Resources (LAWR), UC Davis, CA
2003 – 2007	Vice Chair, Soils and Biogeochemistry Section, LAWR, UC Davis, CA
1993-1995	Associate Professor, LAWR, UC Davis, CA
1990-1993	Assistant Professor, LAWR, UC Davis, CA
1985	Senior Visiting Scientist, CSIRO, Cunningham Lab, Brisbane, Australia
1987-1990	Associate Professor, Range Science, Utah State Univ., Logan, UT
1982-1987	Assistant Professor, Range Science, Utah State Univ., Logan, UT

Recent synergistic activities

Collaborate with Great Basin Air Pollution Control District, Los Angeles Department of Water & Power, Imperial Irrigation District, CH2MHill, AirSciences Inc., and Formation Environmental Inc. to apply knowledge of physiological limits of native plants to low nutrient stress and salinity to improve plant establishment for PM_{10} air pollution mitigation.

Collaborate with Sacramento County Department of Waste Management and Recycling and engineering consultants to apply knowledge of rooting depth, water use, and plant nutrition to design and implement sustainable natural covers that prevent infiltration on closed landfills.

Editorial Board member: Functional Ecology, 2005-2008; Ecology and Ecological Monographs, 2001-2007; UC Davis representative to NEON, Inc. 2007-2010

Serve as faculty mentor in UC Davis summer research for underrepresented high school and undergraduate students (advisees include 1 Native American, 2 SE Asian, 1 Latino) and as faculty mentor for HHMI-SHARP program (1 Chinese). Supervise undergraduate research interns and employees (includes 10 women (4 Asian) and 8 men (2 Latino and 4 Asian).

Major Advisor UCD Grad Group in Ecology: Integrative Ecology Area of Emphasis, (cumulative >132 advisees); Physiological Ecology Area of Emphasis, (cumulative 16 advisees); Chair, Grad Group in Ecology Curriculum Revision Committee, 2002-2004; Graduated 1995-2014: 9 Ph.D. (5 women, 4 men including 1 Chinese-American), 5 M.S. (2 women, 3 men) & 4 postdocs (4 men including 1 Asian/Indian, 1 Chinese-American).

Selected Publications (total peer-reviewed: >130)

Guerra FP, Richards JH, Fiehn O, Famula R, Stantion BJ, Shuren R, Sykes R, Davis MF, Neale DB. 2016. Analysis of the genetic variation in growth, ecophysiology, and chemical and metabolomic composition of wood of *Populus trichocarpa* provenances. **Tree Genetics and Genomes** 12:6 [doi: 10.1007/s11295-015-0965-8]

Busso C, Torres Y, Ithurrart L, Richards JH. 2015. The TTC-technique might not appropriately test the physiological stage of plant tissues**. Russian Journal of Plant Physiology** 62: 551-556.

Des Marais DL, Auchincloss LC, Sukamtoh E, McKay JK, Logan T, Richards JH, Juenger TE. 2014. Variation in *MPK12* affects water use efficiency in *Arabidopsis* and reveals a pleiotropic link between guard cell size and ABA response. **Proceedings of the National Academy of Science** 111: 2836-2841.

Kenney AM, McKay JK, Richards JH, Juenger TE. 2014. Direct and indirect selection on flowering time, water-use efficiency (WUE, $\delta^{13}C$), and WUE plasticity to drought in *Arabidopsis thaliana*. **Ecology and Evolution** 4: 4505-4521.

Auchincloss LC, Easlon HM, Levine DD, Donovan LA, Richards JH. 2014. Predawn stomatal opening does not substantially enhance early morning photosynthesis in *Helianthus annuus*. **Plant, Cell and Environment** 37:1364-1370.

Drenovsky RE, Koehler CE, Skelly K, Richards JH. 2013. Potential and realized nutrient resorption in serpentine and non-serpentine chaparral shrubs and trees. **Oecologia** 171: 39-50.

Tozzi ES, Easlon HM, Richards JH. 2013. Interactive effects of water, light and heat stress on photosynthesis in Fremont cottonwood. **Plant, Cell and Environment** 36: 1423-1434.

Easlon HM, Nemali KS, Richards JH, Hanson DT, Juenger TE, McKay JK. 2013. The physiological basis for genetic variation in water use efficiency and carbon isotope composition in *Arabidopsis thaliana*. **Photosynthesis Research** 119:119-129.

Smesrud JK, Benson CH, Albright WH, Richards JH, Wright S, Israel T, Goodrich K. 2012. Using pilot test data to refine an alternative cover design in Northern California. **International Journal of Phytoremediation.** 14:76-93.

Des Marais DL, McKay JK, Richards JH, Sen S, Wayne T, Juenger TE. 2012. Physiological genomics of response to soil drying in diverse *Arabidopsis thaliana* accessions. **Plant Cell** 24:893-914

Auchincloss LC, Richards JH, Young CA, Tansey MK. 2012. Inundation depth, duration, and temperature influence Fremont cottonwood (*Populus fremontii*) seedling growth and survival. **Western North American Naturalist** 72:323-333.

Lazarus BE, Richards JH, Claassen VP, O'Dell RE, Ferrell MA. 2011. Species specific plant-soil interactions influence plant distribution on serpentine soils. **Plant and Soil** 342: 327–344.

Lazarus BE, Richards JH, Gordon PE, Oki LR, Barnes CS. 2011. Plasticity tradeoffs in salt tolerance mechanisms among desert *Distichlis spicata* genotypes. **Functional Plant Biology** 38: 187–198.

Drenovsky RE, James JJ, Richards JH. 2010. Variation in nutrient resorption by desert shrubs. **Journal of Arid Environments** 74: 1564-68.

Richards JH, Janes BR. 2010. Tolerance limits, plant. pp. 663-667 IN: Simberloff D, Rejmánek M, eds. *Encyclopedia of Biological Invasions,* University of California Press.

Breen AN, Richards JH. 2010. Seed dispersal, seed capture, and seedling recruitment in a temporally variable desert playa. **Western North American Naturalist** 70: 55-66

Aanderud ZT, Richards JH, Svejcar T, James JJ. 2010. A shift in seasonal rainfall reduces soil organic carbon storage in a cold desert. **Ecosystems** 13: 673-682.

Howard AR, van Iersel MW, Richards JH, Donovan LA. 2009. Nighttime transpiration can decrease hydraulic redistribution. **Plant, Cell and Environment** 32: 1060-1070.
Valenzuela-Estrada LR, Richards JH, Diaz A, Eissenstat DM. 2009. Patterns of nocturnal rehydration in root tissues of *Vaccinium corymbosum* under severe drought conditions. **Journal of Experimental Botany** 60: 1241–1247.
Easlon HM, Richards JH. 2009. Drought response in self-compatible species of tomato (Solanaceae). **American Journal of Botany** 96: 605-611.
Christman MA, James JJ, Drenovsky RE, Richards JH. 2009. Environmental stress and genetics influence nighttime leaf conductance in the C_4 grass *Distichlis spicata* (L.) Greene. **Functional Plant Biology** 36: 50-55.
Breen AN, Richards JH. 2008. Irrigation and fertilization effects on seed number, size, germination and seedling growth: Implications for desert shrub establishment. **Oecologia** 157: 13-19.
McKay JK, Richards JH, Nemali KS, Sen S, Mitchell-Olds T, Boles S, Stahl EA, Wayne T, Juenger TE. 2008. Genetics of drought adaptation in *Arabidopsis thaliana* II. QTL analysis of a new mapping population, Kas-1 x Tsu-1. **Evolution** 62: 3014–3026.
Breen AN, Richards JH. 2008. Seedling growth and nutrient content of two desert shrubs growing in amended soil. **Arid Land Research and Management** 22: 46–61.
Aanderud ZT, Shuldman MI, Drenovsky RE, Richards JH. 2008. Shrub-interspace dynamics alter relationships between microbial community composition and belowground ecosystem characteristics. **Soil Biology and Biochemistry** 40: 2206-2216.
Snyder KA, James JJ, Richards JH, Donovan LA. 2008. Does hydraulic lift or nighttime transpiration facilitate nitrogen acquisition? **Plant and Soil** 306: 159–166.
Bauerle TL, Richards JH, Smart DR, Eissenstat DM. 2008. Importance of internal hydraulic redistribution for prolonging the lifespan of roots in dry soil. **Plant, Cell and Environment** 31: 177-186
James JJ, Richards JH. 2007. Influence of temporal heterogeneity in nitrogen supply on competitive interactions in a desert shrub community. **Oecologia** 152: 721-727.
Caird MA, Richards JH, Hsiao TC. 2007. Significant transpirational water loss occurs throughout the night in field-grown tomato. **Functional Plant Biology** 34: 172-177.
Caird MA, Richards JH, Donovan LA. 2007. Nighttime stomatal conductance and transpiration in C_3 and C_4 plants. **Plant Physiology** 143: 4-10.
O'Dell RE, James JJ, Richards JH. 2006. Congeneric serpentine and nonserpentine shrubs differ more in leaf Ca:Mg than in tolerance of low N, low P, or heavy metals. **Plant and Soil** 280: 49-64.
Drenovsky RE, Richards JH. 2006. Low leaf N and P resorption contributes to nutrient limitation in two desert shrubs. **Plant Ecology** 183: 305-314.
James JJ, Richards JH. 2006. Plant nitrogen capture in pulse-driven systems: interactions between root responses and soil processes. **Journal of Ecology** 94: 765-777.
James JJ, Aanderud ZT, Richards JH. 2006. Seasonal timing of N pulses influences N capture in a saltbush scrub community. **Journal of Arid Environments** 67: 688-700.
James JJ, Alder NN, Mühling KH, Läuchli AE, Shackel KA, Donovan LA, Richards JH. 2006. High apoplastic solute concentrations in leaves alter water relations of the halophytic shrub, *Sarcobatus vermiculatus*. **Journal of Experimental Botany** 57: 139-147.
Drenovsky RE, Richards JH. 2005. Nitrogen addition increases fecundity in the desert shrub *Sarcobatus vermiculatus*. **Oecologia** 143: 349-356.
James JJ, JH. Richards. 2005. Plant N capture from pulses: effects of pulse size, growth rate, and other soil resources. **Oecologia** 145: 113-122.

James JJ, Tiller RL, Richards JH. 2005. Multiple resources limit plant growth and function in a saline-alkaline desert community. **Journal of Ecology** 93: 113-126.
Snyder KA, Donovan LA, James JJ, Tiller RL, Richards JH. 2004. Extensive summer water pulses do not necessarily lead to canopy growth of Great Basin and northern Mojave Desert shrubs. **Oecologia** 141: 325-334.
Drenovsky RE, Richards JH. 2004. Critical N:P values: Predicting nutrient deficiencies in desert shrublands. **Plant and Soil** 259: 59-69.
Donovan LA, Richards JH. 2000. Juvenile shrubs show differences in stress tolerance, but no competition or facilitation, along a stress gradient. **Journal of Ecology** 88: 1-16.
Fort KP, Richards JH. 1998. Does seed dispersal limit initiation of primary succession in desert playas? **American Journal of Botany** 85: 1722-1731.
Dahlgren RA, Richards JH, Yu Z. 1997. Soil and groundwater chemistry and vegetation distribution in a desert playa, Owens Lake, California. **Arid Soil Research and Rehabilitation** 11: 221-244.
Donovan LA, Richards JH, Schaber EJ. 1997. Nutrient relations of the halophytic shrub, *Sarcobatus vermiculatus*, along a soil salinity gradient. **Plant and Soil** 190: 105-117.
Donovan LA, Richards JH, Muller MW. 1996. Water relations and leaf chemistry of *Chrysothamnus nauseosus* ssp. *consimilis* (Asteraceae) and *Sarcobatus vermiculatus* (Chenopodiaceae). **American Journal of Botany** 83: 1637-1646.
Matzner SL, Richards JH. 1996. Sagebrush (*Artemisia tridentata* Nutt.) roots maintain nutrient uptake capacity under water stress. **Journal of Experimental Botany** 47: 1045-1056.
Bilbrough CJ,Richards JH. 1993. Growth of sagebrush and bitterbrush following simulated winter browsing: Mechanisms of tolerance. **Ecology** 74: 481-492.
Mott JJ, Ludlow MM, Richards JH, Parsons AD. 1992. Effects of moisture supply in the dry season and subsequent defoliation on persistence of the savanna grasses *Themeda triandra, Heteropogon contortus* and *Panicum maximum.* **Australian Journal of Agricultural Research** 43: 241-260.
Dobrowolski JP, Caldwell MM, Richards JH. 1990. Basin hydrology and plant root systems. pp. 243-292. IN: Osmond CB, Pitelka LF, Hidy GM (eds.) Plant Biology of the Basin and Range, Ecological Studies Vol. 80. Springer, Berlin.
Richards, JH, Caldwell MM. 1987. Hydraulic lift: substantial nocturnal water transport between soil layers by *Artemisia tridentata* roots. **Oecologia** 73: 486-489.
Caldwell MM, Richards JH, Manwaring JH, Eissenstat DM. 1987. Rapid shifts in phosphate acquisition show direct competition between neighboring plants. **Nature** 327: 615-616.
Richards JH. 1986. Root form and depth distribution in several biomes. pp. 82-97. IN: Carlisle D, Berry WL, Kaplan IR, Watterson JR (eds.) Mineral Exploration: Biological Systems and Organic Matter. Rubey Vol. V. Prentice-Hall, Englewood Cliffs, NJ.
Caldwell MM, Richards JH. 1986. Competing root systems: Morphology and models of absorption. pp. 251-273. IN: Givnish TJ (ed.) On the Economy of Plant Form and Function, Cambridge University Press, Cambridge.
Richards JH, Caldwell MM. 1985. Soluble carbohydrates, concurrent photosynthesis and efficiency in regrowth following defoliation: A field study with *Agropyron* species. **Journal of Applied Ecology** 22: 907-920.
Caldwell MM, Eissenstat DM, Richards JH, Allen MF. 1985. Competition for phosphorus: Differential uptake from dual-isotope-labeled soil interspaces between shrub and grass. **Science** 229: 384-386.