

## Donald R. Zak

### Work:

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**Date of Birth:** 16 July, 1958

### Education:

1987 Ph.D., Michigan State University  
1983 M.S., University of Idaho  
1981 B.S. *Cum Laude*, Ohio State University

### Academic Appointments:

2012 to Present	Associate Dean for Academic Programs, School of Natural Resources & Environment, University of Michigan
2009 to Present	Burton V. Barnes Collegiate Professor of Ecology, School of Natural Resources & Environment, University of Michigan
2004 to Present	Professor, Department of Ecology and Evolutionary Biology, University of Michigan
2004 to Present	Adjunct Professor, Department of Geological Sciences, University of Michigan
2000 to Present	Professor, School of Natural Resources & Environment, University of Michigan
1994 to 2000	Associate Professor, School of Natural Resources & Environment, University of Michigan
1988 to 1994	Assistant Professor, School of Natural Resources & Environment, University of Michigan
1987 to 1988	Post-Doctoral Research Associate, Department of Soil Science, and Department of Ecology, Evolution, and Behavior, University of Minnesota
1983 to 1987	Graduate Research Assistant, Department of Forestry, Michigan State University

### Awards and Honors:

Francis Clark Lectureship: Frontiers in Soil Biology – Awarded by the Soil Science Society of America for research excellence in soil microbiology and biochemistry - 2009

Students for SNRE Outstanding Faculty Teaching Award – 2006-2007; 2011-2012

Best Paper Award, Division S-7, Soil Science Society of America Annual Meeting, 1993, Cincinnati, OH.

Best Paper Award, Division S-7, Soil Science Society of America Annual Meeting, 1986, New Orleans, LA.

Graduate Research Fellowships, Michigan State University, 1984, 1985.

Virginia Mowery Graduate Scholarship, University of Idaho, 1982.

Sigma Xi, Xi Sigma Pi, Gamma Sigma Delta

### **Books and Refereed Edited Volumes:**

Barnes, B.V., D.R. Zak, S. Denton. and S.H. Spurr. 1998. *Forest Ecology*, 4<sup>th</sup> Edition. John Wiley & Sons, New York, New York.

Curtis, P.S., E.G. O'Neill, J.A. Teeri, D.R. Zak, and K.S. Pregitzer (eds.) 1995. *Belowground Responses to Rising Atmospheric CO<sub>2</sub>: Implications for Plants, Soil Biota, and Ecosystem Processes*. Kluwer Academic Publishers, The Netherlands.

### **Refereed Journal Articles** (in chronological order):

Zak, D.R., G.E. Host, and K.S. Pregitzer. 1986. Landscape variation of nitrogen mineralization and nitrification. *Canadian Journal of Forest Research* 16:1258-1263.

Zak, D.R. and K.S. Pregitzer. 1988. Nitrate assimilation by herbaceous ground flora in late successional forests. *Journal of Ecology* 76:537-546.

Zak, D.R., G.E. Host, and K.S. Pregitzer. 1989. Regional variability in nitrogen mineralization, nitrification, and overstory biomass in northern Lower Michigan. *Canadian Journal of Forest Research* 19:1521-1526.

Zak, D.R., P.M. Groffman, K.S. Pregitzer, S. Christensen, and J.M. Tiedje. 1990. The vernal dam: plant-microbe competition for nitrogen in northern hardwood forests. *Ecology* 71:651-656.

Zak, D.R., and K.S. Pregitzer. 1990. Spatial and temporal variability of nitrogen cycling in northern Lower Michigan. *Forest Science* 36:367-380.

Zak, D.R., D.F. Grigal, S. Gleeson, and D. Tilman. 1990. Carbon and nitrogen cycling during secondary succession: constraints on plant and microbial biomass. *Biogeochemistry* 11:111-129.

Updegraff, K., D.R. Zak, and D.F. Grigal. 1990. The nitrogen budget of a hybrid poplar plantation in Minnesota. *Canadian Journal of Forest Research* 20:1818-1822.

Zak, D.R., A.B. Hairston, and D.F. Grigal. 1991. Topographic influences on nitrogen cycling within an upland pin oak ecosystem. *Forest Science* 37: 45-65.

Johnson, N.C., D.R. Zak, D. Tilman, and L.F. Pflieger. 1991. Dynamics of vesicular-arbuscular mycorrhizae during old field succession. *Oecologia* 86:349-358.

Zak, D.R., and D.F. Grigal. 1991. Nitrogen mineralization, nitrification, and denitrification in upland and wetland ecosystems. *Oecologia* 88:189-196.

Merrill, A.G., and D.R. Zak. 1992. Factors controlling denitrification in upland and wetland forests. *Canadian Journal of Forest Research* 22:1597-1604.

Randlett, D.L., D.R. Zak, and N.W. MacDonald. 1992. Sulfate adsorption and microbial immobilization in northern hardwood forests along an atmospheric deposition gradient. *Canadian Journal of Forest Research* 22:1843-1850.

Zak, D.R., K.S. Pregitzer, P.S. Curtis, J.A. Terri, R. Fogel, and D.L. Randlett. 1993. Elevated atmospheric CO<sub>2</sub> and feedback between C and N cycles. *Plant and Soil* 151:105-117.

Zak, D.R., D.F. Grigal, and L. Ohmann. 1993. Kinetics of microbial respiration and nitrogen mineralization in Lake States forests. *Soil Science Society of America Journal* 57:1100-1106.

Groffman, P.M., D.R. Zak, S. Christensen, A. Mosier. 1993. Early spring nitrogen dynamics in a temperate forest landscape. *Ecology* 74:1579-1585.

- Holmes, W.E., and D.R. Zak. 1994. Microbial biomass dynamics and net nitrogen mineralization in northern hardwood forests. *Soil Science of America Journal* 58:238-243.
- Babbar, L.I., and D.R. Zak. 1994. Nitrogen cycling in coffee agroecosystems: net nitrogen mineralization and nitrification in the presence and absence of shade trees. *Agriculture, Ecosystems, and Environment* 48:107-113.
- McFadden, J.P., N.W. MacDonald, J.A. Witter, and D.R. Zak. 1994. Fine-textured soil bands and oak forest productivity in northwestern lower Michigan, U.S.A. *Canadian Journal of Forest Research* 24:928-933.
- Gonzalez, O.J. and D.R. Zak. 1994. Geostatistical analysis of soil properties in a tropical dry forest, St. Lucia, West Indies. *Plant and Soil* 163:45-54.
- Toland, D. and D.R. Zak. 1994. Soil respiration in intact and clearcut northern hardwood forests. *Canadian Journal of Forest Research* 24:1711-1716.
- Zak, D.R., D. Tilman, R.R. Parmenter, C.W. Rice, F.M. Fisher, J. Vose, D. Milchunas, and C.W. Martin. 1994. Plant production and soil microorganisms in late-successional ecosystems: a continental-scale study. *Ecology* 75:2333-2347.
- Curtis, P.S., D.R. Zak, K.S. Pregitzer, and J.A. Teeri. 1994. Above- and belowground response of *Populus grandidentata* to elevated atmospheric CO<sub>2</sub> and soil N availability. *Plant and Soil* 165:45-51.
- Curtis, P.S., E.G. O'Neill, J.A. Teeri, D.R. Zak, and K.S. Pregitzer. 1994. Belowground responses to rising CO<sub>2</sub>: Implications for plant, soil biota and ecosystem processes. *Plant and Soil* 165:1-6.
- MacDonald, N.W., D.R. Zak and K.S. Pregitzer. 1995. Temperature effects on the kinetics of microbial respiration and the net mineralization of N and S. *Soil Science Society of America Journal* 59:233-240.
- Babbar, L.I. and D.R. Zak. 1995. Nitrogen loss from coffee agroecosystems in Costa Rica: leaching and denitrification in the presence and absence of shade trees. *Journal of Environmental Quality* 24:227-233.
- Curtis, P.S., C.S. Vogel, K.S. Pregitzer, D.R. Zak, and J.A. Teeri. 1995. Interacting effects of soil fertility and atmospheric CO<sub>2</sub> on leaf area growth and carbon gain physiology in *Populus euramericana*. *New Phytologist* 129:253-263.
- Pregitzer, K.S., D.R. Zak, P.S. Curtis, M.E. Kubiske, J.A. Teeri, and C.S. Vogel. 1995. Atmospheric CO<sub>2</sub>, soil nitrogen and fine root turnover. *New Phytologist* 129:579-585.
- Zak, D.R., D. Ringelberg, K.S. Pregitzer, D.L. Randlett, D.W. White, and P.S. Curtis. 1996. Soil microbial communities beneath *Populus grandidentata* Michx. growing at elevated atmospheric CO<sub>2</sub>. *Ecological Applications* 6:257-262.
- Zogg, G.P., D.R. Zak, A.J. Burton, and K.S. Pregitzer. 1996. Fine root respiration in northern hardwood forests in relation to temperature and nitrogen availability. *Tree Physiology* 16:719-725.
- Randlett, D.L., D.R. Zak, K.S. Pregitzer, and P.S. Curtis. 1996. Elevated atmospheric CO<sub>2</sub> and leaf litter chemistry: influences on microbial respiration and N mineralization. *Soil Science Society of America Journal* 60:1571-1577.

- Rothstein, D.E., D.R. Zak, and K.S. Pregitzer. 1996. Nitrate deposition in northern hardwood forests and the N metabolism of *Acer saccharum* Marsh. *Oecologia* 108:338-344.
- Gonzalez, O.J. and D.R. Zak. 1997. Composition and structure of tropical dry forest of St. Lucia, West Indies: the influence of edaphic properties and disturbance. *Biotropica* 28:618-626.
- Kubiske, M.E., K.S. Pregitzer, C.J. Mikan, D.R. Zak, J.L. Maziasz, and J.A. Teeri. 1997. *Populus tremuloides* photosynthesis and crown architecture in response to elevated CO<sub>2</sub> and soil N availability. *Oecologia* 110: 328-336.
- Klironomos, J.N., M.F. Allen, M.C. Rillig, D.R. Zak, and K.S. Pregitzer. 1997. Increased levels of aero-allergenic fungal propagules in response to elevated atmospheric CO<sub>2</sub>. *Canadian Journal of Botany* 75:1670-1673.
- Zogg, G.P., D.R. Zak, D.B. Ringelberg, N.W. MacDonald, K.S. Pregitzer, and D.C. White. 1997. Compositional and functional shifts in microbial communities related to soil warming. *Soil Science Society of America Journal* 61:475-481.
- Burton, A.J., G.P. Zogg, K.S. Pregitzer, and D.R. Zak. 1996. Latitudinal variation in sugar maple fine-root respiration. *Canadian Journal of Forest Research* 26:1761-1768.
- Klironomos, J.N., M.C. Rillig, M.F. Allen, D.R. Zak, M.E. Kubiske, and K.S. Pregitzer. 1997. Soil fungal-arthropod responses to *Populus tremuloides* grown under enriched atmospheric CO<sub>2</sub> under field conditions. *Global Change Biology* 3:473-478.
- Burton, A.J., G.P. Zogg, K.S. Pregitzer, and D.R. Zak. 1997. Effects of measurement CO<sub>2</sub> concentration on sugar maple root respiration. *Tree Physiology* 17:421-427.
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- Pregitzer, K.S., M.J. Laskowski, A.J. Burton, V.C. Lessard, and D.R. Zak. 1998. Variation in northern hardwood root respiration with root diameter and soil depth. *Tree Physiology* 18:665-670.
- Kubiske, M.E., K.S. Pregitzer, C.J. Mikan, and D.R. Zak. 1998. Growth and C allocation of *Populus tremuloides* clones in response to atmospheric CO<sub>2</sub> and soil N availability. *New Phytologist* 140:251-260.
- Holmes, W.E., and D.R. Zak. 1999. Nitrogen dynamics following clear-cut harvest of northern hardwood ecosystems: microbial control over spatial patterns of N loss. *Ecological Applications* 9:202-215.
- MacDonald, N.W., D.L. Randlett, and D.R. Zak. 1999. Soil warming and carbon loss from a Lake States Spodosol. *Soil Science Society of America Journal* 63:211-218.
- Zak, D.R., W.E. Holmes, N.W. MacDonald, and K.S. Pregitzer. 1999. Soil temperature, matric potential, and the kinetics of microbial respiration and net N mineralization in northern hardwood forests. *Soil Science Society of America Journal* 63: 575-584.
- Mansfield, J.L., P.S. Curtis, D.R. Zak and K.S. Pregitzer. 1999. Genotypic variation for condensed tannin production in trembling aspen (*Populus tremuloides*) under elevated CO<sub>2</sub> and in high and low fertility. *American Journal of Botany* 86: 1154-1159.
- Iseman, T.M., D.R. Zak, W.E. Holmes, and A.G. Merrill. 1999. Nitrogen leaching from Lake States northern hardwood forests following clearcut harvest. *Soil Science Society of America Journal* 63: 1424-1429.

- King, J.S., K.S. Pregitzer, and D.R. Zak. 1999. Clonal variation in above- and below-ground growth responses of *Populus tremuloides* Michaux: influence of soil warming and nutrient availability. *Plant and Soil* 217: 19-130.
- Cutis, P.S., C.S. Vogel, X. Wang, K.S. Pregitzer, D.R. Zak, M.E. Kubiske, and J.A. Teeri. 2000. Gas exchange, leaf nitrogen, and growth efficiency of *Populus tremuloides* in a CO<sub>2</sub> enriched atmosphere. *Ecological Applications* 10: 3-17.
- Pregitzer, K.S., D.R. Zak, J. Maziasz, J. DeForest, P.S. Curtis, and J. Lussenhop. 2000. Interactive effects of atmospheric CO<sub>2</sub> and soil-N availability on fine roots of *Populus tremuloides*. *Ecological Applications* 10: 18-33.
- Zak, D.R., K.S. Pregitzer, P.S. Curtis, C.S. Vogel, W.E. Holmes, and J. Lussenhop. 2000. Atmospheric CO<sub>2</sub>, soil N availability, and the allocation of biomass and nitrogen in *Populus tremuloides*. *Ecological Applications* 10: 34-46.
- Zak, D.R., K.S. Pregitzer, P.S. Curtis, and W.E. Holmes. 2000. Atmospheric CO<sub>2</sub> and the composition and function of soil microbial communities. *Ecological Applications* 10: 47-59.
- Zogg, G.P., D.R. Zak, K.S. Pregitzer, and A.J. Burton. 2000. Microbial immobilization and the retention of anthropogenic nitrate in northern hardwood forests. *Ecology* 81: 1858-1866.
- Rothstein, D.E., D.R. Zak, K.S. Pregitzer, P.S. Curtis. 2000. Kinetics of nitrogen uptake by *Populus tremuloides* in relation to atmospheric CO<sub>2</sub> and soil nitrogen availability. *Tree Physiology* 20: 265-270.
- Zak, D.R., K.S. Pregitzer, J.S. King, and W.E. Holmes. 2000. Elevated atmospheric CO<sub>2</sub>, fine roots and the response of soil microorganisms: a review and hypothesis. *New Phytologist* 147: 201-222.
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- Wang, X.Z., P.S. Curtis, K.S. Pregitzer, and D.R. Zak. 2000. Genotypic variation in physiological and growth responses of *Populus tremuloides* to elevated atmospheric CO<sub>2</sub> concentration. *Tree Physiology* 20: 1019-1028.
- King, J.S., K.S. Pregitzer, D.R. Zak, M.E. Kubiske, J.A. Ashby, and W.E. Holmes. 2001. Chemistry and decomposition of litter from *Populus tremuloides* Michaux grown at elevated atmospheric CO<sub>2</sub> and varying N availability. *Global Change Biology* 7: 65-74.
- Myers, R.T., D.R. Zak, D.C. White, and A. Peacock. 2001. Landscape-level patterns of microbial community composition and substrate use in upland forest ecosystems. *Soil Science Society of America Journal* 65: 359-367.
- King, J.S., K.S. Pregitzer, D.R. Zak, D.F. Karnosky, I.G. Isebrands, R.E. Dickson, G.R. Hendrey, J. Sober. 2001. Fine root biomass and fluxes of soil carbon in young stands of paper birch and trembling aspen as affected by elevated atmospheric CO<sub>2</sub> and tropospheric O<sub>3</sub>. *Oecologia* 128:237-250.
- Rothstein, D.E. and D.R. Zak. 2001. Relationships between plant nitrogen economy and life history in three deciduous-forest herbs. *Journal of Ecology* 89:385-395.

- King, J.S., K.S. Pregitzer, D.R. Zak, M.E. Kubiske, W.E. Holmes. 2001. Correlation of foliage and litter chemistry of sugar maple, *Acer saccharum*, as affected by elevated CO<sub>2</sub> and varying N availability, and effects on decomposition. *Oikos* 94: 403-416
- Rothstein, D.E., and D.R. Zak. 2001. Photosynthetic adaptation and acclimation in three temperate, deciduous-forest herbs. *Functional Ecology* 15: 722-731.
- Fisk, M., D.R. Zak, and T.R. Crow. 2002. Nitrogen storage and cycling in old- and second-growth northern hardwood forests. *Ecology* 83:73-87.
- Phillips, R.L., D.R. Zak, and W.E. Holmes, and D.C. White. 2002. Microbial community composition and function beneath temperate trees exposed to elevated atmospheric CO<sub>2</sub> and O<sub>3</sub>. *Oecologia* 131:236-244.
- Kubiske, M.E., D.R. Zak, K.S. Pregitzer, Y. Takeuchi. 2002. Three years of photosynthetic acclimation to elevated atmospheric CO<sub>2</sub>: overstory *Populus tremuloides* and understory *Acer saccharum*: interactions with shade and soil N. *Tree Physiology* 22: 321-329.
- Saiya-Cork, K.R., R. L. Sinsabaugh, and D. R. Zak. 2002. The effects of long-term nitrogen deposition on extracellular enzyme activity in an *Acer saccharum* forest soil. *Soil Biology & Biochemistry* 34: 1309-1315.
- Davidson, E.A., K. Savage, P. Bolstad, D.A. Clark, P.S. Curtis, D.S. Ellsworth, P.J. Hanson, B.E. Law, Y. Luo, K.S. Pregitzer, J.C. Randolph, D.R. Zak. 2002. Belowground carbon allocation in forests estimated from litterfall and IRGA-based soil respiration measurements. *Forest and Agricultural Meteorology* 113: 39-51.
- Larson, J.L., D.R. Zak, and R.L. Sinsabaugh. 2002. Microbial activity beneath temperate trees growing under elevated CO<sub>2</sub> and O<sub>3</sub>. *Soil Science Society of America* 66:1848-1856.
- Percy, K.E., C. S. Awmack, R. L. Lindroth, M.E. Kubiske, B.J. Kopper, J.G. Isebrands, K.S. Pregitzer, G.R. Hendrey, R.E. Dickson, D.R. Zak, E. Oksanen, J. Sober, R. Harrington, & D.F. Karnosky. 2002. Altered performance of forest pests under CO<sub>2</sub>- and O<sub>3</sub> - enriched atmospheres. *Nature* 420: 403-407.
- Karnosky, D.F., D.R. Zak, K.S. Pregitzer, C.S. Awmack, J.G. Bockheim, R.E. Dickson, G.R. Hendrey, G.E. Host, J.S. King, B.J. Kopper, E.L. Kruger, M.E. Kubiske, R.L. Lindroth, W.J. Mattson, E.P. McDonald A. Noormets, E. Oksanen, W.F.J. Parsons, K.E. Percy, G.K. Podila, D.E. Riemenschneider, P. Sharma, A. Sober, J. Sober, W.S. Jones, S. Anttonen, E. Vapaavuori, and J.G. Isebrands. 2003. Tropospheric O<sub>3</sub> moderates responses of temperate hardwood forests to elevated CO<sub>2</sub>: A synthesis of molecular to ecosystem results from the Aspen FACE project. *Functional Ecology* 17:287-307.
- Zak, D.R., W.E. Holmes, D.C. White, A.D. Peacock, and D. Tilman. 2003. Plant diversity, microbial communities, and ecosystem function: are there any links? *Ecology* 84: 2042-2050.
- Williams, E.L., L.M. Walter, T.C.W. Ku, G.W. Kling, and D.R. Zak. 2003. CO<sub>2</sub> and nutrient availability effects on mineral weathering. *Global Biogeochemical Cycles* 17 (2): Art. No. 1041.
- Holmes, W.E., D.R. Zak, K.S. Pregitzer, and J.S. King. 2003. Nitrogen cycling beneath *Populus tremuloides*, *Betula papyrifera* and *Acer saccharum* growing under elevated CO<sub>2</sub> and O<sub>3</sub>. *Global Change Biology* 9: 1743-1750.

- Sinsabaugh, R.L., K. Saiya-Cork, T. Long, M.P. Osgood, D. Neher, D.R. Zak, and R.J. Norby. 2003. Soil microbial activity in a *Liquidambar* plantation unresponsive to CO<sub>2</sub>-driven increases in primary production. *Applied Soil Ecology* 24:263-271.
- Zak, D.R., W.E. Holmes, A.C. Finzi, R.J. Norby, and W.H. Schlesinger. 2003. Soil nitrogen cycling under elevated CO<sub>2</sub>: a synthesis of forest FACE experiments. *Ecological Applications* 13: 1051-1061.
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- DeForest, J.L., D.R. Zak, K.S. Pregitzer, and A.J. Burton. 2004. Experimental NO<sub>3</sub><sup>-</sup> additions alter microbial community function in northern hardwood forests. *Soil Science Society of America Journal* 68: 132-138.
- Pregitzer, K.S., D.R. Zak, A.J. Burton, and J.A. Ashby. 2004. Chronic nitrate additions dramatically increase the export of carbon and nitrogen in northern hardwood forests. *Biogeochemistry* 68: 179-197.
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- Gallo, M., R. Amonette, C. Lauber, R.L. Sinsabaugh and D.R. Zak. 2004 Microbial community structure and oxidative enzyme activity in nitrogen-amended north temperate forest soils. *Microbial Ecology* 48: 218-229
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- Chapman, J.A., J.S. King, K.S. Pregitzer, and D.R. Zak, 2005. Effects of elevated CO<sub>2</sub> and tropospheric O<sub>3</sub> on the decomposition of fine roots. *Tree Physiology* 25: 1501-1510.
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- Talhelm, A.F., K.S. Pregitzer, M.E. Kubiske, D.R. Zak et al. 2013. Anthropogenic carbon dioxide and ozone offset ecosystem C storage in forest. *Ecology Letters in review*.
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- Kellner, H., P. Luis, M.J. Pecyna, D. Kapturska, D. Krüger, D.R. Zak, R. Marmeisse, M. Vandebol and M. Hofrichter. Widespread occurrence of expressed fungal secretory peroxidases in forest soils. *ISME Journal in review*.
- Gan, H., D.R. Zak and M.D. Hunter. 2013. Atmospheric N deposition and the trophic structure of soil oribatid mites. *Ecology Letters in review*.

#### **Refereed Book Chapters:**

- Christensen, S., P.M. Groffman, A. Mosier, and D.R. Zak. 1991. Rhizosphere denitrification: a minor process but an indicator of decomposition activity. *In* (N.P. Revsbech and J. Sorensen, Eds.) *Denitrification in Soils and Sediments*, Plenum Press, NY.
- Reed, D.D., G.D. Mroz, H.O. Liechty, K.S. Pregitzer, A.J. Burton, D.R. Zak, J.A. Witter, and N.W. MacDonald. 1994. Studying the effects of air pollution on forests along exposure gradients: Experiences in the United States and opportunities for cooperation. p 109-116. *In* climate and atmospheric deposition studies in forests (Solon, J., E. Roo-Sielinska, and A. Bytnerowicz, eds.) *Institute of Geography and Spatial Organization, Polish Academy of Sciences Conference Papers* 19.
- Curtis, P.S., D.R. Zak, K.S. Pregitzer, J. Lussenhop, and J.A. Teeri. 1996. Linking above- and belowground responses to rising  $\text{CO}_2$  in northern deciduous forest species. pp. 41-51 *In* (Koch, G.W., and H.A. Mooney, eds.) *Carbon Dioxide and Terrestrial Ecosystems*. Academic Press, NY.
- Zak, D.R., and K.S. Pregitzer. 1998. Integration of ecophysiological and biogeochemical approaches to ecosystem dynamics. *In* (P.M. Groffman and M.L. Pace, eds.) *Successes, limitations, and frontiers in ecosystem science*. Springer-Verlag, Pub. Inc.
- Pregitzer, K.S., D.R. Zak, W.M. Loya, N. J. Karberg, J.S. King and A.J. Burton 2006. The contribution of roots systems to biogeochemical cycles in a changing world. *In* (Z. Cardon & J. Whitbeck, eds.) *The Rhizosphere – An Ecological Perspective*. Elsevier, The Netherlands.

#### **Refereed Reports:**

- Kling, G.W., K. Hayhoe, L.B. Johnson, J.J. Magnuson, S. Polasky, S.K. Robinson, B.J. Schuter, M.M. Wander, D.J. Wuebbles, and D.R. Zak. 2003. *Confronting Climate Change in the Great Lakes Region*. Union of Concerned Scientists, Cambridge, Massachusetts, and Ecological Society of America, Washington, D.C.

## Funded Research

### Current Research Support - \$ 1,991,049

1. Principal Investigators: D.R. Zak, K.S. Pregitzer, and C. Kuske  
Title: Atmospheric N deposition and microbial mechanisms enhancing soil carbon storage.  
Start Date: 7/1/10 End Date: 6/30/13  
Amount of Award/Sponsor: \$1,789,756/ DoE Biological and Environmental Research
2. Principal Investigator: D.R. Zak, K.S. Pregitzer, and A.J. Burton  
Title: LTREB: Long-term ecosystem response to chronic atmospheric N deposition.  
Start Date: 8/15/08 End Date: 8/14/13  
Amount of Award/Sponsor: \$201,284/ NSF Ecosystems Panel

### Previous Research Awards (in chronological order) - \$15,783,860

1. Principal Investigator: D.R. Zak  
Title: Patterns of Carbon & Mineralization in Forest Ecosystems.  
Start Date: 9/1/89 End Date: 8/31/90  
Amount of Award/Sponsor: \$8,375/USDA-Forest Service
2. Principal Investigators: D.R. Zak and L. Babbar  
Title: Biological Regulation of Nitrogen Cycling in Coffee Plantations.  
Start Date: 5/1/89 End Date: 4/30/90  
Amount of Award/Sponsor: \$19,084/UM Rackham and OVPR
3. Principal Investigator: D.R. Zak  
Title: Nitrogen Loss and Retention in Northern Hardwood Forests.  
Start Date: 10/1/89 End Date: 9/30/91  
Amount of Award/Sponsor: \$59,819/USDA
4. Principal Investigators: J. Witter and D.R. Zak  
Title: Effects of an Air Pollution Gradient on Hardwood Forests in the Great Lakes Region.  
Start Date: 10/1/89 End Date: 9/30/91  
Amount of Award/Sponsor: \$40,000/USDA
5. Principal Investigators: J. Witter and D.R. Zak  
Title: Biological and Physio-Chemical Mechanisms on Sulfate Retention along an Atmospheric Pollution Gradient.  
Start Date: 4/11/89 End Date: 6/30/90  
Amount of Award/Sponsor: \$5,000/UM Michigan Memorial-Phoenix Project
6. Principal Investigators: D.R. Zak and O. Gonzalez  
Title: Spatial Variability of Tropical Soil Fertility.  
Start Date: 5/1/90 End Date: 4/1/91  
Amount of Award/Sponsor: \$4,000/UM Population-Environment Dynamics Program
7. Principal Investigator: D.R. Zak  
Title: Global Change and Elevated Carbon Dioxide: Instrumentation to Measure Carbon Flux Between Plants and Soil Microorganisms.  
Start Date: 12/15/90 End Date: 2/15/91  
Amount of Award/Sponsor: \$20,000/UM-OVPR
8. Principal Investigators: K.S. Pregitzer, D.R. Zak and P.S. Curtis  
Title: Atmospheric CO<sub>2</sub> and Feedback in the Plant-Soil System.

- Start Date: 10/1/90 End Date: 3/31/93  
Amount of Award/Sponsor: \$188,000/USDA
9. Principal Investigators: D.R. Zak, B.V. Barnes, and R. Fogel  
Title: Climate Change and Elevated Atmospheric CO<sub>2</sub>: Shifts in Carbon Flux Between Plants and Soil Microorganisms.  
Start Date: 10/1/91 End Date: 9/30/93  
Amount of Award/Sponsor: \$46,586/USDA
  10. Principal Investigators: J. Witter, D.R. Zak, K. Pregitzer, G. Mroz, and D. Reed  
Title: Climate and Pollutant Influences on Ecosystem Processes in Northern Hardwood Forests.  
Start Date: 8/1/91 End Date: 9/30/94  
Amount of Award/Sponsor: \$446,000/USDA-Forest Service
  11. Principal Investigators: J. Teeri, D.R. Zak, K. Pregitzer, P. Curtis, and J. Lussenhop  
Title: Elevated CO<sub>2</sub> and Feedback in Terrestrial Ecosystems.  
Start Date: 6/15/90 End Date: 5/30/91  
Amount of Award/Sponsor: \$25,000/U of M Global Change Program
  12. Principal Investigators: J. Teeri, D.R. Zak, K. Pregitzer, P. Curtis, and J. Lussenhop  
Title: Above and Below Ground Ecosystem Responses to Elevated Atmospheric CO<sub>2</sub>  
Start Date: 7/1/92 End Date: 6/30/96  
Amount of Award/Sponsor: \$1,250,000/DOE-National Institute for Global Environmental Change
  13. Principal Investigators: K.S. Pregitzer, D.R. Zak, and R. Hendrick  
Title: Effects of Soil Temperature and Nitrate on Fine Root Dynamics in Northern Hardwood Forests.  
Start Date: 1/1/93 End Date: 12/31/96  
Amount of Award/Sponsor: \$491,998/NSF Ecosystems Panel
  14. Principal Investigators: D.R. Zak and K.S. Pregitzer  
Title: Changes in the Flux of Carbon Between Plants and Soil Microorganisms at Elevated CO<sub>2</sub>: Physiological Processes with Ecosystem-Level Implications.  
Start Date: 8/15/93 End Date: 8/14/96  
Amount of Award/Sponsor: \$414,666/DOE-Program for Ecosystem Research
  15. Principal Investigators: D.R. Zak, K.S. Pregitzer, and M.E. Kubiske  
Title: The Belowground Response of Plants and Soil Microorganisms to Elevated CO<sub>2</sub>: Physiological and Ecosystem-Level Processes.  
Start Date: 8/15/96 End Date: 8/14/99  
Amount of Award/Sponsor: \$733,555/DOE Program for Ecosystem Research
  16. Principal Investigator: D. Karnosky  
Co-PI: D.R. Zak and 13 PI from universities in the Great Lakes region  
Title: FACTS II - A free atmospheric CO<sub>2</sub> release experiment in Lake States forests.  
Start Date: 7/1/95 End Date: 6/30/02  
Amount of Award/Sponsor: \$1,078,061/ NSF TECO  
Location: Rhinelander, WS
  17. Principal Investigator: D. Karnosky  
Co-PI: D.R. Zak and 13 PI from universities in the Great Lakes region  
Title: FACTS II – Equipment acquisition for a free atmospheric CO<sub>2</sub> release experiment.

- Start Date: 7/1/95      End Date: 6/30/02  
Amount of Award/Sponsor: \$250,973/ NSF Academic Infrastructure Program
18. Principal Investigator: D. Karnosky  
Co-PI: D.R. Zak and 13 PI from universities in the Great Lakes region  
Title: FACTS II - A free atmospheric CO<sub>2</sub> release experiment in Lake States forests.  
Start Date: 7/1/95      End Date: 6/30/02  
Amount of Award/Sponsor: \$2,619,557/DOE Program for Ecosystem Research
  19. Principal Investigators: K.S. Pregitzer, D.R. Zak, and A.J. Burton  
Title: Cycling of Nitrate in Northern Hardwood Forests: Regulation and Consequences of N Saturation.  
Start Date: 6/1/96      End Date: 9/15/99  
Amount of Award/Sponsor: \$758,643/NSF Ecosystems Panel
  20. Principal Investigators: L. Walter, L. Ambriola, P. Meyers, G. Kling, D.R. Zak  
Title: Carbon Exchange Dynamics in a Temperate Forested Watershed: A Laboratory and Field Multidisciplinary Study.  
Start Date: 3/1/96      End Date: 9/15/99  
Amount of Award/Sponsor: \$800,000/US EPA
  21. Principal Investigators: R.L. Sinsabaugh, D.L. Moorehead, and D.R. Zak  
Title: Biochemical enhancement of soil carbon storage by nitrogen deposition.  
Start Date: 8/1/03      End Date: 7/31/06  
Amount of Award/ Sponsor: \$600,000/DOE Carbon Sequestration Program
  22. Principal Investigator: D.R. Zak  
Title: Acquisition of equipment to study the influence of global change of carbon and nitrogen cycling in terrestrial ecosystems.  
Start Date: 6/1/98      End Date: 5/30/00  
Amount of Award/Sponsor: \$ 300,000/OVPR-SNRE-DOE
  23. Principal Investigators: D.R. Zak and K.S. Pregitzer  
Title: Belowground responses of early- and late-successional trees to elevated CO<sub>2</sub> and O<sub>3</sub>: Alteration of soil food webs and DOC production.  
Start Date: 8/14/99      End Date: 8/14/02  
Amount of Award/Sponsor: \$804,425/DOE Program for Ecosystem Research
  24. Principal Investigators: K.S. Pregitzer, D.R. Zak and A.J. Burton  
Title: Nitrogen saturation: Mechanisms and consequences of altered ecosystem metabolism.  
Start Date: 9/1/03      End Date: 8/31/06  
Amount of Award/Sponsor: \$853,000/ NSF Ecosystems Panel
  25. Principal Investigator: D.R. Zak  
Title: Plant diversity and ecosystem function are linked by microbial communities in soil  
Start Date: 9/1/03      End Date: 8/31/07  
Amount of Award/Sponsor: \$275,000/USDA Soil & Soil Biology
  26. Principal Investigators: R.L. Sinsabaugh, D.L. Moorehead, and D.R. Zak  
Title: Biochemical enhancement of soil carbon storage by nitrogen deposition.  
Start Date: 8/1/06      End Date: 7/31/08  
Amount of Award/ Sponsor: \$600,000/DOE Carbon Sequestration Program
  27. Principal Investigators: K.S. Pregitzer, D.R. Zak and A.J. Burton



Title: From Genes to Ecosystems: Mechanisms Controlling Long-Term Ecosystem Response to Nitrogen Deposition.

Start Date: 9/1/06 End Date: 8/31/09

Amount of Award/Sponsor: \$800,000/ NSF Ecosystems Panel

28. Principal Investigators: D.R. Zak et al.

Title: Impacts of elevated CO<sub>2</sub> and O<sub>3</sub>, alone and in combination, on the structure and functioning of a northern hardwood forest ecosystem: operating the aspen FACE experiment.

Start Date: 6/1/08 End Date: 5/31/11

Amount of Award/Sponsor: \$4,000,000 total; \$ 553,413 to Zak /DOE Program for Ecosystem Research

29. Principal Investigators: D.R. Zak and K.S. Pregitzer

Title: Ecosystem response to elevated CO<sub>2</sub> and O<sub>3</sub> is controlled by plant-microbe interactions in soil.

Start Date: 8/15/05 End Date: 8/14/11

Amount of Award/Sponsor: \$ 1,538,705/DOE Program for Ecosystem Research

### **Post-Doctoral Scholars and Graduate Students Supervised (\*degree received/postdoc completed)**

#### Post-Doctoral Scholars:

Melany Fisk\*  
 Gregory Zogg\*  
 Rebecca Phillips\*  
 Mark Waldrop\*  
 Kurt Smemo\*  
 Christopher Blackwood\*  
 Kirsten Hofmockel\*  
 Harald Kellner\*  
 Ivan Edwards\*  
 Kyle Whittinghill\*  
 Linda van Diepen\*  
 Zachary Freedman

#### Ph.D. Committee Chair:

Otto Gonzales\*  
 Liana Babbar\*  
 William Holmes\*  
 Gregory Zogg\*  
 Carl Mikan\*  
 David Rothstein\*  
 Jared DeForest\*  
 Haegun Chung\*  
 Krista McGuire\* (co-chair)  
 Lesley Sefcik\*  
 Lauren Cline  
 Huijie Gan (co-chair)  
 Elizabeth Entwistle

#### Master's Committee Chair:

David Jones\*  
 William Holmes\*  
 Amy Merrill\*  
 Diana Randlett\*  
 David Toland\*  
 Nancy French\*  
 David Rothstein\*  
 Thomas Iseman\*  
 Rachael Meyer\*  
 Jennifer Larson\*  
 Anne Finan\*  
 John Hassett\*  
 William Eddy\*  
 Sarah Eisenlord\*  
 Lauren Hoffman\*  
 Elizabeth Entwistle\*  
 Sierra Patterson\*  
 Dana Thomas\*  
 Amanda Garzio-Hadzick\*  
 Anna Peschel

#### Undergraduate Honors Thesis Chair:

Steve LuDuc\*  
 Casey Curtis\*  
 Kalub Fedak\*  
 Alaina Ritter\*  
 Lauren Cline\*  
 Kristen Kulik

### **Courses Taught**

General Ecology – EEB 281

Soil Ecology – NRE 430/EEB 489

Ecosystem Ecology – NRE 476/EEB 476

Biodiversity & Ecosystem Function: Are There Any Links? NRE 639-063 Graduate Seminar

Ecosystem Science in the Rockies – GEO/ENVIRON 341

## Professional Societies and Service

### Affiliations:

Ecological Society of America  
 Soil Science Society of America  
 International Society for Microbial Ecology  
 American Association for the Advancement of Science

### Editorial Boards:

1998 to 2000 - *Forest Science*, Associate Editor – Ecology.  
 1998 to 2005 - *Soil Science Society of America Journal*, Associate Editor – Microbial Ecology.  
 2001 to 2004 – *Ecology and Ecological Monographs*, Associate Editor – Microbial Ecology and Biogeochemistry  
 2008 to Present – *Ecological Applications, Ecosphere* Associate Editor – Microbial Ecology and Biogeochemistry  
 2008 to Present – *Nature* Reader Advisory Board  
 2012 to Present – *Elementa* Editor in Chief, Ecology Domain

### Manuscripts Reviewed for:

Applied and Environmental Microbiology, Biological Conservation, Canadian Journal of Forest Research, Ecology, Ecological Applications, Ecosystems, Forest Science, Geoderma, Global Change Biology, Journal of Ecology, Journal of Environmental Quality, Mycological Research, Nature, Oecologia, Pedobiologia, Plant and Soil, Scandinavian Journal of Forest Research, Science, Soil Biology & Biochemistry, Soil Science Society of America Journal, Proceeding of the National Academy of Science

### Review Panels:

NSF LTER Panel 2008  
 NSF Ecosystems Studies Program Panel 2001 - 2005  
 Scientific Advisory Committee, Duke FACE Experiment 2003-2006  
 NSF Site Review Team – National Phytotron Laboratory 1999  
 NSF Site Review Team – Toolik Lake and Bonanza Creek LTERs 2001  
 Terrestrial Carbon Processing Program, Dept. of Energy 1994, 1995

### Grants Reviewed for:

National Science Foundation Ecosystems Panel and Ecology Panel, Department of Energy, U.S. Department of Agriculture, Kearney Foundation

### National Advisory Boards

Science Advisory Board, Climate Change Program, Oak Ridge National Lab – 2009-2011  
 National Technical Advisory Committee, National Institute of Global Environmental Change (NIGEC), Department of Energy 2001-2003

Invited Presentations:

Ecology and Evolutionary Biology Program, Michigan State University - 1991  
 NSF/LTER Coordinating Committee Meeting, Rhinelander, WI - 1992  
 Institute for Ecosystem Studies, New York Botanical Garden, Millbrook, NY - 1992  
 Forest Service University, USDA Forest Service, Milwaukee, WI - 1992  
 Forest Service University, USDA Forest Service, Chicago, IL-1993  
 Aspen Global Change Institute, Aspen, CO - 1990, 1991, 1993  
 University of Michigan Biological Station - 1992, 1998, 2007  
 Annual Meeting of the Ecological Society of America, Climate Change Symposium, 1994  
 Global Change Program, University of Michigan - 1992, 1996  
 Seventh Cary Conference, Institute of Ecosystems Studies - 1997  
*BIOGEMON*, 3<sup>rd</sup> International Sym. on Ecosystem Behavior, Villanova University- 1997  
 Global Change and Terrestrial Ecosystems (GCTE) Program, Duke University- 1998  
 GCTE Program - Climate Change and Litter Decomposition, Capri, Italy - 1998  
 Plant Biology Council Seminar, University of Guelph - 1999  
 Ecology Seminar Series, University of Illinois-Chicago, Chicago, IL - 1999  
 Root Dynamics and Global Change, sponsored by *New Phytologist* and GCTE, Townsend,  
 TN – 1999  
 Department of Biology Seminar Series, University of Toledo -2001  
 Program in Ecology Seminar Series, Duke University - 2002  
 Ecology Seminar Series, University of California, Berkeley – 2002  
 Dept. Environ., Pop. and Organismal Biology, Univ. of Colorado -- 2004  
 Carnegie Institution, Stanford University – 2006  
 Department of Biology, Notre Dame University – 2006  
 Ecological Society of America Meeting - Invited Symposium – 2007  
 Soil Science Society of America Meeting – Invited Symposium – 2007  
 Plant Biology Symposium, Penn State University – 2009  
 International Soil Organic Matter Dynamics Symposium, Colorado Springs, CO – 2009  
 F.E.Clark Distinguished Lectureship in Soil Biology, SSSA Annual Meeting, Pittsburg --  
 2009  
 International Society for Microbial Ecology Meeting, Seattle, WA – 2010  
 Microbial Ecology of Forest Soils Workshop – Plenary Address, Lund University, Lund  
 Sweden -- 2011  
 Soil Microbiology Conference, Czech Academy of Sciences, Plenary Address, Czech  
 Academy of Sciences, Prague, Czech Republic – 2011  
 Department of Ecology, Peking University, Beijing, China – 2011  
 Fungal Genetics Meeting, Monterey CA - 2013