

## **John M. Blair**

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### **Education**

Ph.D.	1987	University of Georgia, Athens, GA	Entomology (Ecology emphasis)
M.S.	1983	Kent State University, Kent, OH	Biology
B.S.	1980	Kent State University, Kent, OH	Biology

### **Positions Held**

2008-present	Edwin G. Brychta Professor of Biology, Division of Biology, Kansas State University
2008-present	Associate Director, Division of Biology, Kansas State University
2006-present	University Distinguished Professor, Division of Biology, Kansas State University
2001-2006	Professor, Division of Biology, Kansas State University
1999-present	Director and PI, Konza Prairie Long-Term Ecological Research (LTER) Program
1997-2001	Associate Professor, Division of Biology, Kansas State University
1992-1997	Assistant Professor, Division of Biology, Kansas State University
1991-1992	Research Scientist, Dept Entomology (Soil Ecology Program), Ohio State University
1988-1991	Senior Researcher, Dept Entomology (Soil Ecology Program), Ohio State University
1987-1988	Postdoctoral Associate, Department of Entomology, University of Georgia

### **Research Interests**

Ecosystem ecology and terrestrial biogeochemistry; Grasslands and global change; Soil ecology, including decomposition, soil nutrient cycling, litter/soil/plant nutrient dynamics; Effects of climate change and other disturbances on ecosystem processes; Restoration ecology; Ecology of soil invertebrates.

### **Membership in Professional Societies**

American Institute of Biological Sciences  
Ecological Society of America  
International Soil Science Society  
Soil Ecology Society (President, 1996-97)

### **Professional Activities, Recognition and Awards**

Member, LTER Executive Board, 2011-present  
Member, LTER Coordinating Committee/Science Council, 1999-present  
Chair, LTER Science Council Meeting Planning Committee, 2011  
Member, National Ecological Observatory Network (NEON, Inc.) Board of Directors, 2009-2011  
Member, Review Panel, NSF Frontiers in Integrated Biology Research Program, 2007  
Member, LTER Network Science Conference Committee, 2005-2006  
Invited Participant, Interagency Ecosystems Working Group for the Climate Change Science Plan, 2004  
Member, LTER Network Science Working Group (Biogeochemistry), 2004-2005  
Member, National Ecological Observatory Network (NEON) Design Consortium, Science and Human Dimensions Committee, Biogeochemical Cycles Subcommittee, 2004-2005  
Member, Review Panel, EPA STAR Fellowship Program, 2004  
Member, Review Panel, NSF BE-Coupled Biogeochemical Cycles Program, 2003-2004  
Member, College of Reviewers for the Canada Research Chairs Program, 2002-present  
Member, Review Panel, NSF Integrated Rsrch Challenges in Environ Biol Program, 1999-2000  
Recipient, W. L. Stamey Undergraduate Teaching Award, College of Arts and Sciences, KSU, 1998  
Member, Review Panel, NASA/NSF/DOE/USDA/EPA/NOAA TECO Program, 1998  
Member, Editorial Board, Ecology (Ecological Society of America), 1997-2000  
Member, NSF site review teams, RTG program (1994), LTER program (1997)

President, Soil Ecology Society, 1996-1997  
Member, Editorial Board, Applied Soil Ecology (Elsevier), 1995-1997  
Member, Review Panel, NSF Dissertation Research Award Program, 1995  
Member, Editorial Board, Biology and Fertility of Soils (Springer-Verlag), 1994-1997  
Member, Review Panel, USDA/NRICGP Forest/Rangeland/Crop Ecosystems Program, 1993  
Fellowship recipient, OECD Cooperative Research Project on Biological Resource Management, 1990  
Recipient, Outstanding Ph.D. Student Award, Department of Entomology, UGA, 1987  
Recipient, University of Georgia Competitive University-Wide Assistantships, 1985-1987  
Recipient, University of Georgia Foundation Scholarship Award, 1983

## **University Service**

President, University Distinguished Professor Group, KSU, 2011  
Associate Director for Faculty Development, KSU Division of Biology, 2008-present  
Member, Vice Provost for Undergraduate Studies Search Committee, 2012  
Member, Dean of Arts and Sciences Search Committee, KSU, 2008-2009  
Chair, Tenure and Promotion Committee, KSU Division of Biology, 2007-present  
Member, College Committee on Planning, KSU College of Arts and Sciences, 2003-2006  
Member, Dean's Advisory Committee, KSU College of Arts and Sciences, 2002-2005  
Member, Tenure and Promotion Committee, KSU Division of Biology, 2001- 2007  
Member, Konza Environmental Educational Program (KEEP) Advisory Committee, 1999-present  
Member, Konza Prairie Biological Station Advisory Committee, 1995-present  
Member, Graduate Affairs Committee, KSU Division of Biology, 1994-2008

## **Educational Activities**

### **Courses Taught**

Fundamentals of Ecology (BIOL 529), 1993 - present  
Nutrient Dynamics (BIOL 826), 1994 - present  
Principles of Biology (BIOL 198), 1992 - 2006  
Ecology Laboratory (BIOL 632), 2003 - 2008  
Presentations in Ecology (BIOL 862), 1994 - 2002

### **Graduate Students Advised**

Heather A. O'Lear, M.S. 1996, Kansas State University  
Chris Bakker, M.S. 1998, University of Groningen (local supervisor for visiting student)  
Mac A. Callahan, Ph.D. 2000, Kansas State University (currently Research Ecologist, USDA Forest Service, Athens, GA)  
Mark D. Norris, M.S. 2000, Kansas State University (currently Assistant Professor, Environmental Science & Biology, SUNY Brockport, NY)  
Sara G. Baer, Ph.D. 2001, Kansas State University (currently Associate Professor, Plant Biology, Southern Illinois University, Carbondale, IL)  
Chris W. Harper, M.S. 2002, Kansas State University (currently employed by The Nature Conservancy)  
G.F. (Ciska) Veen, M.S. 2004, University of Groningen - local supervisor for visiting student (currently Ph.D student, University of Groningen, The Netherlands)  
Elske Koppenaal, M.S. 2004, University of Groningen - local supervisor for visiting student (currently Ph.D. student, University of Groningen, The Netherlands)  
Duane Kitchen, Ph.D. 2005, Kansas State University (former Associate Professor, Biology, Rockford College, Rockford, IL)  
Duncan McKinley, Ph.D. 2006, Kansas State University (currently Policy Analyst, U.S. Forest Service Washington, D.C.)  
Kathryn N. Schmitt McCain, Ph.D. 2008, Kansas State University (currently Resource Scientist, Missouri Dept of Conservation, Jackson, MO)  
Steven Rostkowski, M.S. 2010, Kansas State University

Dan Carter, Ph.D. (in progress), Kansas State University  
Michael Carson, M.S. (in progress), Kansas State University

### **Post Doctoral Associates**

Wilfred Singogo (1993-94)

Clarence Turner (1994-95)

### **Undergraduate Students Mentored in Research**

Jack Shaw, NSF REU, 1993

Jeffery Neel, NSF REU, 1994

Rita Schartz, NSF REU, 1994

Greg Shenk, NSF LTER, 1995

Casey Wright, NSF, 1996

Stephanie Huff, Cntr Basic Cancer  
Resrch, 1997

Mandy Stone, NSF REU, 1998

Karoline Jarr, NSF REU, 1998

Jessica Allewalt, NSF REU, 1999

Anna Fiedler, NSF REU, 2000

Judd Patterson, NSF LTER, 2003

Matt LaRosh, NSF LTER, 2003-04

Brian Hollaway, NSF REU, 2004

Patrick Mollett, K-INBRE, 2005-06

Aaron Berdanier, NSF REU, 2006

Lauren Gillespie, NSF REU, 2007

Andres Andrade, NSF REU, 2007

Lori Wadell, NSF REU 2008

### **Publications – Journal Articles (names of my students are underlined)**

Carter, D.L. and J.M. Blair. *In press*. High richness and dense seeding enhance grassland restoration establishment, but have little effect on drought response. *Ecological Applications*.

Carter, D., B. VanderWeide and J.M. Blair. *In press*. Drought-mediated stem and belowground bud dynamics in restored grasslands. *Applied Vegetation Science*.

Carter, D.L. and J.M. Blair. 2012. Recovery of native plant community characteristics on a chronosequence of restored prairies seeded into pastures in West-Central Iowa. *Restoration Ecology*. 20: 170–179.

Fay, P.A., J.M. Blair, M.D. Smith, J.B. Nippert, J.D. Carlisle, and A.K. Knapp. 2011. Relative effects of precipitation variability and warming on tallgrass prairie ecosystem function. *Biogeosciences* 8:3053-3068.

McCain, K.N.S., G.W.T. Wilson, and J.M. Blair. 2011. Mycorrhizal suppression alters plant productivity and forb establishment in a grass-dominated prairie restoration. *Plant Ecology* 212:1675-1685.

Ippolito, J.A., S.W. Blecker, C.L. Freeman, R.L. McCulley, J.M. Blair, and E.F. Kelly. 2010. Phosphorus biogeochemistry across a precipitation gradient in grasslands of central North America. *Journal of Arid Environments* 74:954-961.

Jangid, K., M.A. Williams, A.J. Franzluebbers, J.M. Blair, D.C. Coleman and W.B. Whitman. 2010. Development of soil microbial communities during tallgrass prairie restoration. *Soil Biology & Biochemistry* 42:302-312.

Jumpponen, A., K.L. Jones, and J.M. Blair. 2010. Vertical distribution of fungal communities in tallgrass prairie soil. *Mycologia* 102:1027-1041.

McCain, K.N.S., S.G. Baer, J.M. Blair, and G.W.T. Wilson. 2010. Dominant grasses suppress local diversity in restored tallgrass prairie. *Restoration Ecology* 18:40-49.

Melzer, S.E., A.K. Knapp, K.P. Kirkman, M.D. Smith, J.M. Blair and E.F. Kelly. 2010. Fire and grazing impacts on silica production and storage in grass dominated ecosystems. *Biogeochemistry* 97:263–278.

Buis, G.M., J.M. Blair, D.E. Burkepile, C.E. Burns, A.J. Chamberlain, P. Chapman, S.L. Collins, R.W.S. Fynn, N. Govender, K. Kirkman, M.D. Smith and A.K. Knapp. 2009. Controls of aboveground net primary production in mesic grasslands and savannas: An interhemispheric comparison. *Ecosystems* 12:982–995.

- Heisler-White, J.L., J.M. Blair, E.F. Kelly, K. Harmony and A.K. Knapp. 2009. Contingent productivity responses to more extreme rainfall regimes across a grassland biome. *Global Change Biology* 15:2894-2904.
- Kitchen, D.J., J.M. Blair and M.A. Callahan, Jr. 2009. Annual fire and mowing alter biomass, depth distribution, and C and N content of roots and soil in tallgrass prairie. *Plant and Soil* 323:235-247.
- Reed, H.E., J.M. Blair, D. Wall and T.R. Seastedt. 2009. Persistent effects of past burn regimes on decomposition in response to reduced precipitation in tallgrass prairie. *Applied Soil Ecology* 42:79-85.
- Baer, S.G. and J.M. Blair. 2008. Grassland establishment under varying resource availability: A test of positive and negative feedback. *Ecology* 89:1859-1871.
- Macpherson, G.L., J.A. Roberts, J.M. Blair, M.A., Townsend, D.A. Fowle and K.R. Beisner. 2008. Increasing shallow groundwater CO<sub>2</sub> and limestone weathering, Konza Prairie, USA. *Geochimica et Cosmochimica Acta* 72:5581-5599.
- Marshall, J.D., J.M. Blair, D. Peters, G. Okin, A. Rango and M. Williams. 2008. Predicting and understanding ecosystem responses to climate change at continental scales. *Frontiers in Ecology and the Environment* 6:273-280.
- McKinley, D.C. and J.M. Blair. 2008. Woody plant encroachment by *Juniperus virginiana* in a mesic native grassland promotes rapid carbon and nitrogen accrual. *Ecosystems* 11:454-468.
- McKinley, D.C., C.W. Rice and J.M. Blair. 2008. Conversion of grassland to coniferous woodland has limited effects on soil nitrogen cycle processes. *Soil Biology & Biochemistry* 40:2627-2633.
- Veen, G.F., J.M. Blair, M.D. Smith and S.L. Collins. 2008. Influence of grazing and fire frequency on small-scale plant community structure and resource variability in native tallgrass prairie. *Oikos* 117:859-866.
- Norris, M.A., J.M. Blair and L.C. Johnson. 2007. Altered ecosystem nitrogen dynamics as a consequence of land cover change in tallgrass prairie. *American Midland Naturalist* 158:432-445.
- Jones, K.L., T.C. Todd, J. L. Wall-Beam, J.D. Coolon, J.M. Blair and M.H. Herman. 2006. Molecular approach for assessing responses of microbial-feeding nematodes to burning and chronic nitrogen enrichment in a native grassland. *Molecular Ecology* 15:2601-2609.
- Baer, S.G., J.M. Blair, S.L. Collins and A.K. Knapp. 2005. Soil heterogeneity effects on tallgrass prairie community heterogeneity: an application of ecological theory to restoration ecology. *Restoration Ecology* 13:413-424.
- Briggs, J.M., A.K. Knapp, J.M. Blair, J.L. Heisler, G.A. Hoch, M.S. Lett and J.K. McCarron. 2005. An ecosystem in transition: causes and consequences of the conversion of mesic grassland to shrubland. *BioScience* 55:243-254.
- Harper, C.W., J.M. Blair, P.A. Fay, A.K. Knapp and J.D. Carlisle. 2005. Increased rainfall variability and reduced rainfall amount decreases soil CO<sub>2</sub> flux in a grassland ecosystem. *Global Change Biology* 11:322-334.
- Reed, H., T.R. Seastedt and J.M. Blair. 2005. Ecological consequences of C<sub>4</sub> grass invasion of a C<sub>4</sub> grassland: A dilemma for management. *Ecological Applications* 15:1560-1569.
- Baer, S.G., J.M. Blair, S.L. Collins and A.K. Knapp. 2004. Plant community responses to resource availability and heterogeneity during restoration. *Oecologia* 139:617-629.
- Heisler, J.L., J.M. Briggs, A.K. Knapp, J.M. Blair and A. Seery. 2004. Direct and indirect effects of fire on shrub expansion in a mesic grassland. *Ecology* 85:2245-2257.

- Lett, M.S., A.K. Knapp, J.M. Briggs and J.M. Blair. 2004. Influence of shrub encroachment on aboveground net primary productivity and carbon and nitrogen pools in a mesic grassland. *Canadian Journal of Botany* 82:1363-1370.
- Silletti, A.M., A.K. Knapp and J.M. Blair. 2004. Competition and coexistence in grassland co-dominants: responses to neighbor removal and resource availability. *Canadian Journal of Botany* 82:450-460.
- Al-Deeb, M.A., G.E. Wilde, J.M. Blair and T.C. Todd. 2003. Effect of *Bt* corn for corn rootworm control on nontarget soil microarthropods and nematodes. *Environmental Entomology* 32:859-865.
- Baer, S.G., J.M. Blair, A.K. Knapp and S.L. Collins. 2003. Soil resources regulate productivity and diversity in newly established tallgrass prairie. *Ecology* 84:724-735.
- Bakker, C., J.M. Blair and A.K. Knapp. 2003. A comparative assessment of potential mechanisms influencing plant species richness in grazed grasslands. *Oecologia* 137:385-391.
- Callahan, M.A., Jr., J.M. Blair, T.C. Todd, D.J. Kitchen, and M.R. Whiles. 2003. Macroinvertebrates in North American tallgrass prairie soils: Effects of fire, mowing, and fertilization on density and biomass. *Soil Biology & Biochemistry* 35:1079-1093.
- Fay, P.A., J.D. Carlisle, A.K. Knapp, J.M. Blair and S.L. Collins. 2003. Productivity responses to altered rainfall patterns in a C<sub>4</sub>-dominated grassland. *Oecologia* 137: 245-251.
- McCarron, J.K., A.K. Knapp, and J.M. Blair. 2003. Soil C and N responses to woody plant expansion in a mesic grassland. *Plant and Soil* 257:183-192.
- Baer, S.G., D.J. Kitchen, J.M. Blair and C.W. Rice. 2002. Changes in ecosystem structure and function in a chronosequence of grasslands restored through the Conservation Reserve Program. *Ecological Applications* 12:1688-1701.
- Callahan, M.A., Jr., M.R. Whiles and J.M. Blair. 2002. Annual fire, mowing and fertilization effects on two cicadas (Homoptera: Cicadidae) in tallgrass prairie. *American Midland Naturalist* 148:90-101.
- Fay, P.A., J.D. Carlisle, B.T. Danner, M.S. Lett, J.K. McCarron, C. Stewart, A.K. Knapp, J.M. Blair and S.L. Collins. 2002. Altered rainfall patterns, gas exchange and growth in C<sub>3</sub> and C<sub>4</sub> grassland species. *International Journal of Plant Sciences* 163:549-557.
- Knapp, A.K., P.A. Fay, J.M. Blair, S. L. Collins, M. D. Smith, J. D. Carlisle, C. W. Harper, B. T. Danner, M.S. Lett and J. K. McCarron. 2002. Rainfall variability, carbon cycling and plant species diversity in a mesic grassland. *Science* 298:2202-2205.
- Callahan, M.A., Jr., J.M. Blair and P.F. Hendrix. 2001. Different behavioral patterns of the earthworms *Octolasion tyraeum* and *Diplocardia* spp. in tallgrass prairie soils: potential influences on plant growth. *Biology and Fertility of Soils* 34:49-56.
- Norris, M.D., J.M. Blair and L.C. Johnson. 2001. Land cover change in eastern Kansas: litter dynamics of closed-canopy eastern redcedar forests in tallgrass prairie. *Canadian Journal of Botany* 79:214-222.
- Norris, M.D., J.M. Blair, L.C. Johnson and R.B. McKane. 2001. Assessing changes in biomass, productivity, and C and N stores following *Juniperus virginiana* forest expansion into tallgrass prairie. *Canadian Journal of Forest Research* 31:1940-1946.
- Baer, S.G., C.W. Rice and J.M. Blair. 2000. Assessment of surface soil quality in field planted to native grasses with short- and long-term enrollment in the CRP. *Journal of Soil and Water Conservation* 55:142-146.
- Blair, J.M., S.L. Collins and A.K. Knapp. 2000. Ecosystems as functional units in nature. *Natural Resources & Environment* 14:150-155. Invited essay.

Fay, P.A., J.D. Carlisle, A.K. Knapp, J.M. Blair and S.L. Collins. 2000. Altering rainfall timing and quantity in a mesic grassland ecosystem: Design and performance of rainfall manipulation shelters. *Ecosystems* 3:308-319.

Callahan, M.A. Jr. and J.M. Blair. 1999. Influence of differing land management on the invasion of North American tallgrass prairie soils by European earthworms. *Pedobiologia* 43:507-512.

Hendrix, P.F., M.A. Callahan, Jr., S.L. Lachniet, J.M. Blair, S.W. James and X. Zou. 1999. Stable isotopic studies of resource utilization by nearctic earthworms (*Diplocardia*, Oligochaeta) in subtropical savanna and forest ecosystems. *Pedobiologia* 43:818-823.

Knapp, A.K., J.M. Blair, J.M. Briggs, S.L. Collins, D.C. Hartnett, L.C. Johnson and E.G. Towne. 1999. The keystone role of bison in North American tallgrass prairie. *BioScience* 49:39-50.

O'Lear, H.A. and J.M. Blair. 1999. Responses of soil microarthropods to changes in soil water availability in tallgrass prairie. *Biology and Fertility of Soils* 29:207-217.

Todd, T.C., J.M. Blair and G.A. Milliken. 1999. Effects of altered soil water availability on a tallgrass prairie nematode community. *Applied Soil Ecology* 13:45-55.

Collins, S.L., A.K. Knapp, J.M. Briggs, J.M. Blair and E. Steinauer. 1998. Modulation of diversity by grazing and mowing in native tallgrass prairie. *Science* 280:745-747.

Knapp, A.K., S.L. Conard and J.M. Blair. 1998. Determinants of soil CO<sub>2</sub> flux from a sub-humid grassland: effect of fire and fire history. *Ecological Applications* 8:760-770.

Blair, J.M. 1997. Fire, N availability, and plant response in grasslands: A test of the transient maxima hypothesis. *Ecology* 78:2359-2368.

Turner, C.L., J.M. Blair, R.J. Schartz and J.C. Neel. 1997. Soil N availability and plant response in tallgrass prairie: Effects of fire, topography and supplemental N. *Ecology* 78:1832-1843.

Blair, J.M., M.F. Allen, R.W. Parmelee, D.A. McCartney and B.R. Stinner. 1997. Changes in soil N pools in response to earthworm population manipulations under different agroecosystem treatments. *Soil Biology & Biochemistry* 29:361-367.

Ketterings, Q.M., J.M. Blair and J.C.Y. Marinissen. 1997. Effects of earthworm activity on soil aggregate stability and carbon and nitrogen storage in a legume cover crop nitrogen-based agroecosystem. *Soil Biology & Biochemistry* 29:401-408.

Stinner, B.R., D.A. McCartney, J.M. Blair, R.W. Parmelee and M.F. Allen. 1997. Effects of organic and inorganic fertilized agroecosystems and earthworm manipulations on crop and weed biomass. *Soil Biology & Biochemistry* 29:423-426.

Nokes, S.E., N.R. Fausey, S. Subler and J.M. Blair. 1997. Stand, yield, weed biomass, and surface residue cover comparisons between three cropping/tillage systems on a well-drained silt loam soil in Ohio, USA. *Soil and Tillage Research* 44:95-108.

O'Lear, H.A., T.R. Seastedt, J.M. Briggs, J.M. Blair and R.A. Ramundo. 1996. Fire and topographic affects on decomposition rates and nitrogen dynamics of buried wood in tallgrass prairie. *Soil Biology & Biochemistry* 28:323-329.

Willems, J.J.G.M., J.C.Y. Marinissen and J.M. Blair. 1996. Effects of earthworms on nitrogen mineralization. *Biology and Fertility of Soils* 23:57-63.

Dodds, W.K., J.M. Blair, G.M. Henebry, J.K. Koelliker, R. Ramundo and C.M. Tate. 1996. Nitrogen transport from tallgrass prairie by streams. *Journal of Environmental Quality* 25:973-987.

Blair, J.M., P.J. Bohlen, C.A. Edwards, B.R. Stinner, D.A. McCartney and M.F. Allen. 1995. Manipulation of earthworm populations in field experiments in agroecosystems. *Acta Zoologica Fennica* 196:48-51.

- Subler, S., J.M. Blair and C.A. Edwards. 1995. Using anion exchange membranes to measure soil nitrate availability and net nitrification. *Soil Biology & Biochemistry* 27:911-917.
- Bohlen, P.J., R.W. Parmelee, J.M. Blair, C.A. Edwards and B.R. Stinner. 1995. Efficacy of methods for manipulating earthworm populations in large-scale field experiments in agroecosystems. *Soil Biology & Biochemistry* 27:993-999.
- Blair, J.M., R.W. Parmelee and R.L. Wyman. 1994. A comparison of forest floor invertebrate communities of four forest types in the northeastern U.S. *Pedobiologia* 38:146-160.
- Blair, J.M., D.A. Crossley, Jr. and L.C. Callaham. 1992. Incorporation of exogenous <sup>15</sup>N in decomposing litter and movement through the forest floor profile: Effects of litter quality and microarthropods. *Biology and Fertility of Soils* 12:241-252.
- Blair, J.M., D.A. Crossley, Jr., and L.C. Callaham. 1991. A litterbasket technique for measurement of nutrient dynamics in forest floor. *Agriculture, Ecosystems and Environment* 34:465-471.
- Crossley, D.A., Jr and J.M. Blair. 1991. A high-efficiency, "low-technology" Tullgren-type extractor for soil microarthropods. *Agriculture, Ecosystems and Environment* 34:187-192.
- Blair, J.M., R.W. Parmelee and M.H. Beare. 1990. Decay rates, nitrogen fluxes and decomposer communities of single- and mixed-species foliar litter. *Ecology* 71:1976-1985.
- Blair, J.M., D.A. Crossley, Jr. and S. Rider. 1989. Effects of naphthalene on microbial activity and nitrogen pools in soil-litter microcosms. *Soil Biology & Biochemistry* 21:507-510.
- Parmelee, R.W., M.H. Beare, and J.M. Blair. 1989. Decomposition and nitrogen dynamics of surface weed residues in no-tillage agroecosystems under drought conditions: Influence of resource quality on the decomposer community. *Soil Biology & Biochemistry* 21:97-103.
- Beare, M.H., J.M. Blair and R.W. Parmelee. 1989. Resource quality and trophic response to simulated throughfall: Effects on decomposition and nutrient flux in a no-tillage agroecosystem. *Soil Biology & Biochemistry* 21:1027-1036.
- Blair, J.M. 1988. Nitrogen, phosphorus and sulfur dynamics in decomposing deciduous leaf litter in the southern Appalachians. *Soil Biology & Biochemistry* 20:693-701.
- Blair, J.M. 1988. Nutrient release from decomposing foliar litter of three tree species with special reference to calcium, magnesium and potassium dynamics. *Plant and Soil* 110: 49-55.
- Blair, J.M., and D.A. Crossley, Jr. 1988. Litter decomposition, nitrogen dynamics and litter microarthropods in a southern Appalachian hardwood forest eight years following clearcutting. *Journal of Applied Ecology* 25:683-698.
- Blair, J.M., and B.A. Foote. 1984. Resource partitioning in five sympatric species of *Scatella* (Diptera: Ephydriidae). *Environmental Entomology* 13:1336-1339.

### **Publications – Book Chapters**

- McKinley, D.C., M.D. Norris, L.C. Johnson, and J.M. Blair. 2008. Biogeochemical changes associated with *Juniperus virginiana* encroachment into grasslands. Pages 170-187 In *Ecological Studies Series 196 - Western North American Juniperus Communities: A Dynamic Vegetation Type* (O.W. Van Auken ed.), Springer-Verlag, NY.
- Knapp A.K., J.K. McCarron, A.M. Silletti, G.A. Hoch, J.L. Heisler, M.S. Lett, J.M. Blair, J.M. Briggs, and M.D. Smith. 2008. Ecological consequences of the replacement of native grassland by *Juniperus virginiana* and other woody plants. Pages 156-169 In *Ecological Studies Series 196 - Western North American Juniperus Communities: A Dynamic Vegetation Type* (O.W. Van Auken ed.), Springer-Verlag, NY.

- Bohlen, P.J., R.W. Parmelee and J.M. Blair. 2004. Integrating the effects of earthworms on nutrient cycling across spatial and temporal scales. Pages 161-180 In *Earthworm Ecology*, 2<sup>nd</sup> Ed. (C.A. Edwards, ed.). CRC Press, St. Lucie Press, Boca Raton, Florida.
- Fay, P.A., A.K. Knapp, J.M. Blair, J.D. Carlisle, J.K. McCarron, B.T. Danner. 2003. Rainfall timing, soil moisture dynamics, and plant responses in a mesic tallgrass prairie ecosystem. Pages 147-163 In *Changing Precipitation Regimes and Terrestrial Ecosystems. A North American Perspective*. (J.F. Weltzin and G.R. McPherson, eds.), University of Arizona Press.
- Blair, J.M., T.C. Todd and M.A. Callahan, Jr. 2000. Responses of grassland soil invertebrates to natural and anthropogenic disturbances. Pages 43-71 In *Invertebrates as Webmasters in Ecosystems* (D.C. Coleman and P.F. Hendrix, eds.), CAB International Press.
- Coleman, D.C., J.M. Blair, E.T. Elliott and D.H. Wall. 1999. Soil invertebrates. Pages 349-377 In *Standard Soil Methods for Long Term Ecological Research* (G.P. Robertson, C.S. Bledsoe, D.C. Coleman and P. Sollins, eds.) Oxford University Press, New York.
- Harmon, M.E., K.J. Nadelhoffer and J.M. Blair. 1999. Measuring decomposition, nutrient turnover and stores in plant litter. Pages 202-240 In *Standard Soil Methods for Long Term Ecological Research* (G.P. Robertson, C.S. Bledsoe, D.C. Coleman and P. Sollins, eds.) Oxford University Press, New York.
- Robertson, G.P., D. Wedin, P.M. Groffman, J.M. Blair, E. Holland, K.J. Nadelhoffer and D. Harris. 1999. Soil carbon and nitrogen availability: Nitrogen mineralization, nitrification, soil respiration potentials. Pages 258-271 In *Standard Soil Methods for Long Term Ecological Research* (G.P. Robertson, C.S. Bledsoe, D.C. Coleman and P. Sollins, eds.) Oxford University Press, New York.
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## **Publications – Proceedings and Special Publications**

Baer, S.G., J.M. Blair and A.K. Knapp. 1999. Manipulation of soil resource heterogeneity in a tallgrass prairie restoration. Pages 78-87 In *Proceedings of the Sixteenth North American Prairie Conference* (J.T. Springer, ed.), University of Nebraska at Kearney, Kearney, NE.

Knapp, A. K., J. M. Blair and J. M. Briggs. 1998. Long-term ecological consequences of varying fire frequency in a humid grassland. Pages 173-178 In *Fire in Ecosystem Management: Shifting the Paradigm from Suppression to Prescription* (T.L. Pruden and L.A. Brennan, eds.), Tall Timbers Fire Ecology Conference, No. 20, Tall Timbers Research Station, Tallahassee, FL.

Su, H., J.M. Briggs, A.K. Knapp, J.M. Blair, and J.R. Krummel. 1996. Detecting Spatial and temporal patterns of aboveground production in a tallgrass prairie using remotely-sensed data. Pages 2361-2365 In *1996 International Geoscience and Remote Sensing Symposium Proceedings*, IEEE (Institute of Electrical and Electronics Engineers, Inc.), Vol. IV.

Nokes, S.E., J.M. Blair and S. Subler. 1993. Evaluation of crop and weed growth differences between management systems at the Ohio MSEA for 1991 and 1992. Pages 292-294 In *Agricultural Research to Protect Water Quality (Proceedings of the Conference, Feb. 21-24, 1993, Minneapolis, Minnesota)*. Soil and Water Conservation Society, Ankeny, IA.

Subler, S., J.M. Blair, C.A. Edwards, S.E. Nokes and M. McCort. 1993. Nitrogen cycling in newly established chisel-plow and ridge-till corn systems at the Ohio MSEA: Differences in fertilizer use efficiency. Pages 530-532 In *Agricultural Research to Protect Water Quality (Proceedings of the Conference, Feb. 21-24, 1993, Minneapolis, Minnesota)*. Soil and Water Conservation Society, Ankeny, IA.

## **Publications – Educational**

Nippert, J.B., and J.M. Blair. Comparing the influence of precipitation, fire, and topography on plant productivity in the tallgrass prairie. *Teaching Issues and Experiments in Ecology*, Vol. 3: Issues: Data Set #1 [[http://tiee.ecoed.net/vol/v3/issues/data\\_sets/konza/abstract.html](http://tiee.ecoed.net/vol/v3/issues/data_sets/konza/abstract.html)]. 2005.

## **Major Grants Funded (approx. \$30M in funded projects; \$13M as PI and \$17M as Co-PI)**

Collaborative Research: LTREB: The role of ecological heterogeneity in a long-term grassland restoration experiment. S.G. Baer (PI-SIU) and J.M. Blair (PI-KSU)

Funding Agency: NSF Long-Term Research in Environmental Biology

Duration: 2012 – 2017

Award Amount: \$450,000 (\$131,087 KSU portion)

Collaborative research: Convergence and contingencies in savanna grasslands. M.D. Smith (PI-Yale) A.K. Knapp (PI-CSU), and S.L. Collins (PI-UNM), J.M. Blair (PI-KSU)

Funding Agency: NSF

Duration: 2009 - 2012

Award Amount: \$707,000 (\$64,063 KSU portion)

LTER VI: Grassland dynamics and long-term trajectories of change. J.M. Blair (PI), W.K. Dodds, D.C. Hartnett, A. Joern, J.B. Nippert and others

Funding Agency: NSF Long-Term Ecological Research Program

Duration: 2008 – 2014

Award Amount: \$5,640,000

Interactive effects of altered rainfall timing and elevated temperature on soil communities and processes. J.M. Blair (PI), and A.K. Knapp

Funding Agency: DOE/NICCR

Period Covered: 2007 – 2011

Award Amount: \$622,552 (\$446,765 KSU portion)

Grassland structure and function in response to warming and more extreme precipitation patterns. A.K. Knapp (PI), J.M. Blair (Co-PI), and M.D. Smith

Funding Agency: UDSA/NRI Managed Ecosystems Program

Period Covered: 2007 – 2010

Award Amount: \$399,648 (\$148,108 to KSU)

En-Gen: Ecological genomics of soil nematode community responses: Model and non-model approaches. M.H. Herman (PI), K.L. Jones, T.C. Todd and J.M. Blair (Co-PI)

Funding Agency: NSF Environmental Genomics Program

Period Covered: 2007 – 2010

Award Amount: \$622,598

Understanding and forecasting ecological change: Causes, trajectories and consequences of environmental change in the Central Plains. W.K. Dodds (PI), J.M. Blair (Co-PI), and J. Harrington

Funding Agency: NSF EPSCoR Program

Period Covered: 2006 – 2009

Award Amount: \$3,488,700

Collaborative research: Convergence and contingencies in savanna grasslands. A.K. Knapp (PI-CSU), J.M. Blair (PI-KSU), M. Smith (PI-Yale) and S.L. Collins (PI-UNM)

Funding Agency: NSF Ecology & Ecosystems Programs

Period Covered: 2005 – 2008

Award Amount: \$830,000 (\$150,000 KSU portion)

Collaborative research: LTREB- Long-term ecosystem responses to more extreme precipitation patterns and warming. J.M. Blair (PI-KSU) and A.K. Knapp (PI-CSU)

Funding Agency: NSF LTREB Program

Period Covered: 2005 – 2010

Award Amount: \$300,000 (\$202,065 KSU portion)

Effects of altered rainfall timing and warming on soil processes and plant responses in a grassland ecosystem. J.M. Blair (PI), A.K. Knapp and P.A. Fay

Funding Agency: DOE/NICCR

Period Covered: 2006 – 2007

Award Amount: \$135,837

Effects of altered rainfall timing and warming on soil processes and plant responses in a grassland ecosystem. J.M. Blair (PI), A.K. Knapp and P.A. Fay

Funding Agency: DOE/NIGEC

Period Covered: 2005 – 2006

Award Amount: \$133,500

Bridging the divide: Linking genomics to ecosystem responses to climatic change. M.D. Smith (PI), J. Bai, J.M. Blair (Co-PI), P.A. Fay, K. Garrett, S. Hulbert, A.K. Knapp, J. Leach and S. Travers.

Funding Agency: DOE, Office of Science (BER), Program for Ecosystem Research

Period Covered: 2004 – 2007

Award Amount: \$1,484,939

Strategically positioning K-State to benefit from NSF's CUAHSI and NEON programs. D.R. Steward (PI), J.M. Blair (Co-PI) and J. K. Koelliker.

Funding Agency: KSU Provost's Targeted Excellence Program

Period Covered: 2005 – 2007

Award Amount: \$381,790

Functional genomic approaches to study organismal response to global environmental change. M. Herman (PI), L.C. Johnson (PI), J.M. Blair (Co-PI) and others.

Funding Agency: NSF EPSCoR Program  
Period Covered: 2003 – 2006  
Award Amount: \$2,091,528

Ecosystem responses to experimental warming and more extreme precipitation patterns. A.K. Knapp (PI) and J.M. Blair (Co-PI)

Funding Agency: UDSA/NRI Managed Ecosystems Program  
Period Covered: 2003 – 2007  
Award Amount: \$300,000

Climatic variability and ecosystem response: Precipitation patterns, soil moisture dynamics, and productivity in tallgrass prairie. J.M. Blair (PI) and P.A. Fay

Funding Agency: NSF Ecosystems Program  
Period Covered: 2002 – 2006  
Award Amount: \$447,214

LTER V: Long-term research on grassland dynamics and global change. J.M. Blair (PI), J.M. Briggs, D.C. Hartnett, L.C. Johnson, A.K. Knapp and others

Funding Agency: NSF Long-Term Ecological Research Program  
Duration: November 1, 2002 – October 31, 2009  
Award Amount: \$4,680,000 (original request) + \$641,722 (supplemental funding)

Belowground responses to multiple climate change factors: Interactive effects of warming and more extreme precipitation patterns on grassland ecosystems. J.M. Blair (PI), A.K. Knapp and P.A. Fay.

Funding Agency: DOE/NIGEC  
Duration: July 1, 2002 – Sept 30, 2005  
Award: \$394,475

Scaling up the ecosystem consequences of forest expansion in the Great Plains region: A renewal proposal. L.C. Johnson (PI), K. Price, J.M. Blair (Co-PI), and R.B. McKane.

Funding Agency: NASA/Land Cover and Land-Use Change Research  
Duration: October 15, 2001 – October 14, 2004  
Award Amount: \$575,000

International collaboration to assess comparative responses of South African and North American grasslands to fire. A.K. Knapp (PI) and J.M. Blair (Co-PI)

Funding Agency: NSF International Studies Program  
Duration: February 15, 2000 – February 14, 2001  
Award: \$26,232

Acquisition of an isotope ratio mass spectrometer in the KSU-UK-CU Consortium. L.C. Johnson (PI), J.M. Blair (Co-PI), W.K. Dodds, G.L. Macpherson and V. Terwilliger

Funding Agency: National Science Foundation  
Duration: September 1, 1999 – August 31, 2001  
Award: \$169,400

Grassland ecosystem responses to the experimental manipulation of precipitation. A.K. Knapp (PI), J.M. Blair (Co-PI) and P.A. Fay

Funding Agency: UDSA/NRI Ecosystems Program  
Duration: September 1, 1999 – August 31, 2002  
Amount: \$253,500

Belowground responses to manipulation of precipitation timing and amounts in a grassland. J.M. Blair (PI), A.K. Knapp and P.A. Fay

Funding Agency: DOE/NIGEC  
Duration: July 1, 1999 – June 30, 2002.  
Amount: \$331,000

The Tallgrass Prairie of the Flint Hills: A documentary. D.C. Hartnett (PI), J.S. Altman, A.G. Larrabee, A.K. Knapp and J.M. Blair (Co-PI)

Funding Agency: NSF Informal Science Education Program  
Duration: July 1, 1998 - June 30, 2000  
Amount: \$383,780

Land-cover change in the Great Plains: Predicting the impacts of regional forest expansion on biogeochemical processes. L. Johnson (PI), J.M. Briggs, J.M. Blair (Co-PI), C.W. Rice, J. Ham and R.B. McKane.

Funding Agency: NASA/Land Cover and Land-Use Change Research  
Duration: May 1, 1997 - April 30, 2000.  
Amount: \$485,000

Evaluating the role of resource heterogeneity in restoring grasslands. A. Knapp (PI) & J.M. Blair (Co-PI).

Funding Agency: NSF Basic Research in Conservation and Restoration Biology  
  
Duration: February 1, 1997 - September 30, 2000.  
Amount: \$178,196

Experimental manipulation of variability in precipitation in grasslands. A. Knapp (PI) & J. Blair (Co-PI).

Funding Agency: USDA/NRICGP Ecosystems Program  
Duration: September 1, 1996 - August 30, 1999  
Amount: \$288,915

Acquisition of two controlled environmental chambers. L.C. Johnson (PI), A.K. Knapp, J.M. Blair (Co-PI), D.C. Hartnett, C.R. Rice and T.C. Todd.

Funding Agency: USDA/NRICGP Equipment Program  
Duration: September 1, 1996 - August 31, 1997  
Amount: \$49,171

Long-term ecological research in tallgrass prairie: The Konza Prairie LTER Program. A.K. Knapp (PI), J.M. Briggs, J.M. Blair (Co-PI) D.C. Hartnett, L.C. Johnson, D.W. Kaufman, and W.K. Dodds.

Funding Agency: NSF Long-Term Ecological Research Program  
Duration: October 15, 1996 - October 14, 2002  
Amount: \$3,360,000 (original request) + 703,236 (supplemental funding)

Acquisition of high performance liquid chromatograph and gas chromatograph/mass spectrometer for studying dissipation of organic contaminants. A.P. Schwab (PI), with M.K. Banks, J.M. Blair (Co-PI), L.C. Davis, L. Erickson, F. Oehme and J. Pickrell.

Funding Agency: National Science Foundation  
Duration: October 15, 1994 - October 14, 1995  
Amount: \$100,000

The capacity of Ft. Riley tallgrass prairie to support military training activity- Preliminary analysis. P.S. Gipson (PI), A.K. Knapp, P.A. Fay, J.M. Blair (Co-PI), J.M. Briggs and others.

Funding Agency: USA/CERL  
Duration: September 13, 1994 - May 1, 1997  
Amount: \$154,380

Use of remotely sensed data on phenological activity and heterogeneity to detect changes in grassland species composition in response to stress. J.M. Briggs (PI), C.L. Turner, J.M. Blair (Co-PI), W.K. Dodds, D.G. Goodin, G.M. Henebry, M.D. Nellis and A.K. Knapp.

Funding Agency: Environmental Protection Agency  
Duration: October 1, 1994 - September 30, 1997  
Amount: \$210,842

Effects of record precipitation inputs on soil-plant nitrogen relationships in tallgrass prairie. J.M. Blair (PI) and C.L. Turner.

Duration: November 1, 1993 - March 31, 1995  
Funding Agency: National Science Foundation  
Amount: \$59,900

Effects of altered soil moisture and temperature on soil communities, primary producers and ecological processes in grasslands. J.M. Blair (PI), C.W. Rice, T.C. Todd and A.K. Knapp.

Funding Agency: DOE/NIGEC Great Plains Regional Center  
Duration: July 1, 1993 - October 31, 1996.  
Amount: \$234,850

Effects of earthworms on nitrogen cycling processes and decomposer community structure in organic-based and conventional agroecosystems. B.R. Stinner (PI), J.M. Blair (Co-PI) and C.A. Edwards.

Funding Agency: National Science Foundation  
Duration: January 31, 1991 - February 1, 1996  
Amount: \$733,093 (\$94,341 transferred to KSU, J.M. Blair PI)

Effects of resource quality and microarthropods on forest floor nitrogen dynamics. D.A. Crossley, Jr. (PI) and J.M. Blair (Co-PI).

Funding Agency: National Science Foundation  
Duration: September 1, 1989 - August 31, 1992  
Amount: \$220,000

### **Invited Presentations and Seminars (last five years only)**

Blair, J.M. Konza Prairie Biological Station as a model for long-term research into grassland dynamics. Grasslands in a Global Context Symposium, Kansas State University, September 12-14, 2011. Invited symposium presentation.

Blair, J.M. Fire and grazing as modulators of grassland ecosystem processes. Grasslands in a Global Context Symposium, Kansas State University, September 12-14, 2011. Invited symposium presentation.

Blair, J.M. Assessing the sensitivity of grassland ecosystems to climate change. 10<sup>th</sup> Annual LTER Symposium, National Science Foundation, March 11, 2011. Invited symposium presentation.

Jumpponen, A. and J.M. Blair. Effects of fire on belowground processes in a tallgrass prairie ecosystem. Heilongjiang Academy of Forestry, Harbin, China, August 25, 2011. Invited seminar.

Blair, J.M. Grassland responses to fire, grazing & climate: How long-term research can contribute to management of grasslands in a changing world. University of California-Santa Cruz. April 26, 2010. Invited seminar.

Blair, J.M. Assessing grassland ecosystem responses to a changing climate. Department of Ecology and Evolutionary Biology, University of Kansas, February 11, 2010. Invited seminar.

Blair, J.M. Assessing impacts of climate change on ecosystem processes in grasslands. Steppe Ecosystems and Climate and Land Use Changes – Vulnerability, Feedbacks and Possibilities for Adaptation. Institute for Meteorology and Climate, Garmisch-Partenkirchen, Germany, November, 2009. Invited workshop presentation.

Blair, J.M. Ecological consequences of changing fire and grazing regimes for grassland conservation. Regional and Global Network of Grassland Ecosystem Research: Issues and Perspectives, Chinese Academy of Sciences, Beijing, China, August, 2009. Invited symposium presentation.

- Blair, J.M. Grassland responses to fire, grazing and climate: How long-term research can contribute to management of grasslands in a changing world. 35<sup>th</sup> Natural Areas Conference, Nashville, TN, October, 2008. Invited symposium presentation.
- Knapp, A.K., M.D. Smith and J.M. Blair. Climate change and tallgrass prairie. Joint Meeting of the Society for Rangeland Management and the American Forage and Grassland Council, Louisville, KY, January 2008. Invited symposium presentation.
- Blair, J.M. Long-term ecological research at the Konza Prairie. American Ecological Engineering Society conference, Manhattan, KS, May 24, 2007. Invited presentation.

### **Contributed Presentations (last five years only)**

- Briggs, J.M. and J.M. Blair. Assessing the ecological impacts of changing climate and land-cover in tallgrass prairie. Ecological Society of America meeting, Austin, TX, August, 2011.
- Blair, J.M., P.A. Fay, A.K. Knapp, M.D. Smith and S.L. Collins. Impacts of altered rainfall timing and warming in a mesic grassland ecosystem. Ecological Society of America meeting, Pittsburgh, PA, August, 2010.
- Heisler-White, J.L., J. Morgan, W.J. Parton, J.M. Blair, N.R. Chiariello, J.S. Dukes, P.A. Fay, C.B. Field, S.S. Hoepfner, M. Hovenden, A.K. Knapp, Y. Luo, S. Niu, E. Pendall and V. Suseela. Modeled effect of warming on ecosystem carbon and water dynamics within grassland-oldfield ecosystems along a moisture gradient. Ecological Society of America meeting, Pittsburgh, PA, August, 2010.
- Rostkowski, S.C. Jr., J.M. Blair, C.W. Rice and T.C. Todd. Long-term effects of climate change on grassland soil systems: A reciprocal transplant approach. Ecological Society of America meeting, Pittsburgh, PA, August 2010.
- Carter, D.L. and J.M. Blair. Plant community trends across a chronosequence of reconstructed prairies in West-Central Iowa. 22<sup>nd</sup> North American Prairie Conference, Ames, IA, August 2010.
- Knapp, A.K., M.D. Smith, J.M. Blair, and S.L. Collins. Grassland ecosystem responses to short- and long-term experimental manipulations of precipitation regime. American Geophysical Union meeting, San Francisco, CA, December 2010.
- Hoover, D.L., G. Buis, A. Chamberlain, R.W.S. Fynn, D.E. Burkepile, T. Schreck, J.M. Blair, M.D. Smith, S.L. Collins and A.K. Knapp. Large ungulate herbivory and ANPP in South African and North American savanna grasslands. Ecological Society of America meeting, Albuquerque, NM, August 2009.
- Knapp, A.K., S.L. Collins, M.D. Smith, J.M. Blair, J.M. Briggs and J.K. Koelliker. Trajectories of grassland ecosystem change in response to altered precipitation patterns. Ecological Society of America meeting, Albuquerque, NM, August 2009.
- Koerner, S.E., S.L. Collins, A.K. Knapp, J.M. Blair, and M.D. Smith. Grazing alters grassland sensitivity to more extreme precipitation regimes in tallgrass prairie. Ecological Society of America meeting, Albuquerque, NM, August 2009.
- Kelly, E.F., A.K. Knapp, S.W. Blecker, S.E. Melzer, R.L. McCulley, C.M. Yonker, O.A. Chadwick, M.D. Smith, J.M. Blair, K. Kirkman, and N. Govender. Mobilization of silica in terrestrial grassland ecosystems and the potential impact on the global silica cycle. Ecological Society of America meeting, Milwaukee, WI, August 2008.
- Knapp, A.K., G. Buis, R.W.S. Fynn, K. Kirkman, N. Govender, J.M. Blair, C.E. Burns, S.L. Collins, and M.D. Smith. Convergence and contingency in patterns and controls of productivity in South African and North American savanna grasslands. Ecological Society of America meeting, Milwaukee, WI, August 2008.

- Collins, S.L., M.D. Smith, R.W.S. Fynn, K. Kirkman, P.D. Wragg, J.M. Blair, C.E. Burns, and A.K. Knapp. Patterns and controls of community structure in South African and North American grasslands: Convergence and contingency. Ecological Society of America meeting, Milwaukee, WI, August 2008.
- Blair, J.M., P.A. Fay, A.K. Knapp, M.D. Smith and J.D. Carlisle. Interactive effects of warming and altered rainfall timing on ecosystem processes in tallgrass prairie. Ecological Society of America meeting, San Jose, CA, August 2007.
- Heisler, J.L., A.K. Knapp, G.M. Kelly and J.M. Blair. Climate change in the Great Plains: More extreme precipitation patterns impact ecosystem function differentially across the central US. Ecological Society of America meeting, San Jose, CA, August 2007.
- Schmitt McCain, K.M., and J.M. Blair. Effects of dominant grass removal on plant diversity in restored tallgrass prairie. Ecological Society of America meeting, San Jose, CA, August 2007.
- Jumpponen, A., K.L. Jones, and J.M. Blair. 2007. Use of a massively parallel sequencing strategy to assess soil eukaryote responses to altered precipitation and warming. Mycological Society of America meeting. Baton Rouge, LA, August 2007.
- Kitchen, D.J., and J.M. Blair. Temporal variation in fine root production and mortality is influenced by prescribed fire and mowing in tallgrass prairie. Soil Ecology Society Meeting, Moab, UT, April 2007.

### **Description of Research**

My research focuses on ecosystem dynamics, including patterns and controls of plant productivity, decomposition and soil organic matter dynamics, and nutrient cycling in both natural and managed terrestrial ecosystems. Much of my current research is directed at understanding the biological and physical factors controlling ecosystem processes in grasslands, and how these processes are altered by the direct and indirect effects of human activities. Listed below are a few current research projects.

### **Grassland ecosystems and climate change**

The structure and function of grassland ecosystems in the Central Plains are strongly influenced by an extremely variable continental climate. This is especially true in tallgrass prairie, where many of the defining characteristics of the ecosystem are a result of interactions of climate with fire and grazing. Within grasslands, the importance of both amounts and timing of precipitation inputs as forcing functions for grassland ecosystems makes them particularly vulnerable to the changes in precipitation predicted by global climate change models. For the Central Plains region, these predictions generally include decreased summer precipitation, increased temperatures and, perhaps most importantly, increased variability in both the amounts and timing of rainfall events. This is particularly important, since climatic variability is at least as important as mean climate values in determining the structure and function of grassland ecosystems. Major goals of my research in this area are to determine how key belowground patterns and processes are altered in response to two key aspects of predicted climate change -- (1) altered timing of rainfall events, and (2) increases in mean annual temperature -- and to identify the potential consequences of these responses for grassland ecosystem structure and function. Our approach to addressing these problems includes irrigation transects, reciprocal soil core transplants between sites with different climates, and large, field-scale Rainfall Manipulation Plots in which the timing and amounts of individual rainfall events, and mean annual temperature, can be experimentally manipulated to assess the independent and interactive effects of altered precipitation regimes and warming on soil and ecosystem-level processes. These effects are being integrated with measurements of plant ecophysiological processes, plant genomic responses, and plant community dynamics, which will provide unique insights into the importance of the climate change in mesic grasslands worldwide.

### **Responses of soil processes and plant productivity to topography, fire and grazing in tallgrass prairie**

The cycling and availability of nutrients, especially nitrogen (N), affects both the structure and dynamics of tallgrass prairie ecosystems. Nutrient availability can limit productivity and alter species composition of tallgrass prairie plant communities, affect plant physiological responses to the environment, determine nutritional quality for herbivores, and influence rates of litter decomposition. This portion of my research program focuses on soil N dynamics in relation to patterns of plant productivity, N uptake and nitrogen use

efficiency on watersheds being intensively studied as part of the Konza LTER effort, as well as in small-plot experiments. Quantifying the effects of topographic position and fire frequency on spatial and temporal patterns of soil N availability, net N mineralization and plant responses are major components of this research. Litter decomposition studies also are being done to address the effects of resource quality, topographic position, and frequency of burning on above- and below-ground decomposition processes in tallgrass prairie ecosystems. I have also conducted studies of the effects of native ungulate grazers (bison) on spatial and temporal patterns of resource availability and plant responses. These studies are targeted at providing increased understanding of landscape-level patterns and controls of soil N availability and soil-plant N relationships in tallgrass prairie ecosystems.

### **Convergence and contingencies in savanna grasslands in North America and South Africa.**

The distribution, structure and function of savannas and mesic grasslands (savanna grasslands) worldwide are a product of three interacting drivers - fire, grazing by large herbivores, and extreme climatic fluctuations. Although all savanna grasslands share these drivers, fire and grazing may affect ecosystem structure and function in fundamentally different ways in southern Africa (SA) and North America (NA). These differences have been attributed to the contingent factors of greater age, longer evolutionary history, lower soil fertility, and greater diversity of plants and large herbivores in SA. An alternative hypothesis is that differences in methods and approaches used to study these systems, and a strong NA bias in the number of studies of savanna grasslands, has led to differing perspectives on the role of these drivers. It's important to differentiate between these alternatives. If the impacts of shared and fundamental ecosystem drivers - fire and grazing regimes, which are being extensively altered by humans worldwide - truly differ with age and evolutionary history, this calls into question our basic understanding of savanna grasslands and our ability to forecast change and maintain ecosystem services. This research is focused on quantifying, in directly comparable ways, ecosystem and community responses to fire and grazing in savanna grasslands of SA and NA, and to identify those ecological processes that are similar (convergent), despite potential contingent factors of differing evolutionary history, herbivore diversity and soil fertility.

### **Restoration ecology**

Many critical ecosystem attributes recover very slowly following restoration efforts. For example, plant species richness and diversity in restored ecosystems is usually much lower than in comparable undisturbed ecosystems, and may take decades or longer to approach undisturbed ecosystem levels. In grasslands, it is relatively easy to restore the dominant C<sub>4</sub> grasses, but difficult to establish the diverse C<sub>3</sub> forb populations characteristic of native grasslands. Most grassland restorations occur where soil resources have been homogenized (e.g., agricultural fields). In contrast, most native ecosystems exhibit high spatial heterogeneity in resources, which is assumed to enhance plant species diversity (e.g., individual plant species may alter and maintain levels of resources (such as soil N) that differ from unvegetated areas or from beneath other species). We have established a long-term field experiment, in which soil N and soil depth (water availability) are altered in a spatially explicit fashion to better understand the abiotic and biotic constraints ("filters") to the re-assembly of diverse tallgrass prairie communities, with the dual goals of advancing the theory and practice of ecological restoration. Additional studies are underway to assess the role of aboveground competition for light and belowground mutualistic associations (mycorrhizae) on the ability of forb species to colonize an established grassland matrix. These experiments will provide new insights into the role of resource heterogeneity and biotic interactions in the restoration of ecosystems.

### **Ecological consequences of woody vegetation expansion into grasslands**

Forest encroachment and the expansion of woody plants into grasslands is a worldwide phenomenon, and an important land-cover change in the grasslands of North America. Increased woody plant cover can be directly attributed to changes in land management and may be indirectly facilitated by other factors (e.g., altered climate, N deposition, habitat fragmentation). My students and I have been assessing the consequences of ecosystem conversion from C<sub>4</sub> grass to C<sub>3</sub> woody plant dominance. In particular, we have focused on the ecological effects of eastern redcedar (*Juniperus virginiana*) expansion into areas that were historically native grasslands. The conversion of grassland to redcedar woodland can result in relatively rapid changes losses of species diversity, increases in NPP, and increases in C and N storage.