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CURRICULUM VITAE

EDUCATION

University of Wisconsin-Madison

Ph.D., Forestry, 1986

Specialty - Forest Ecology; Minor - Applied Statistics; Advisor - Craig Lorimer

University of Wisconsin-Madison

B.S., Bacteriology, 1980; Botany, 1979

Post-doctoral positions in Forest Soils/Acid Rain with James Bockheim, University of Wisconsin-Madison and in Paleoecology with Margaret B. Davis, University of Minnesota.

CURRENT POSITIONS

Research Associate, University of Minnesota, Department of Forest Resources, College of Agriculture, Food, and Natural Resource Science, 1992-to date

Senior Member of the Graduate Faculty in four programs: (1) Conservation Biology; (2) Ecology, Evolution and Behavior; (3) Invasive species (Ph.D. Minor program); and (4) Natural Resource Science and Management

Director, The University of Minnesota Center for Hardwood Ecology, 1998-to date

AREAS OF EXPERTISE

Boreal forest dynamics (Jack pine, spruce, fir, white and red pine)

Disturbance ecology, including fire and wind

Ecosystem management in forests

Hardwood forests (oak and maple)

Invasive species (European earthworm) impacts in forests

Ungulate herbivory (deer) in forests

Modeling of growth and dynamics of vegetation and landscapes

Neighborhood effects and species coexistence in plant communities

Old growth forest and natural area evaluation, restoration and management

Paleoecology and long-term dynamics of vegetation

Urban forestry

Global warming impacts in forests

CURRENT PROJECTS

- Exotic earthworm invasion in Midwestern hardwood forests (with P. Reich, C. Hale, A. Holdsworth).

- Moss community structure in northern Minnesota and Oregon rainforests (with P. Reich, J. Janssens, J. Peck).
- Boreal forest response to large-scale wind, fire and wind-fire combinations in the Boundary Waters Canoe Area Wilderness (with P. Reich, R. Rich, T. Serres).
- Tree growth form across species ranges in Eastern North America. (With Bob Van Pelt, Bob Leverett, Will BLozan, Eastern Native Tree Society).
- Long-term dynamics of hemlock and maple forests in Sylvania Wilderness, MI (with M.B. Davis, S. Sugita, T. Salk).
- Multiple impacts in forests: Global warming, invasive species, deer grazing, and disturbance regime change (With P. Reich, N. Fisichelli, C. Bapikee).

TEACHING EXPERIENCE / ADVISING

Eleven graduate students completed and 5 in progress (11 Ph.D. and 6 M.S.; 2 Native American, 2 other minorities, 6 female); 26 other graduate student committee assignments completed and 10 in progress.

- 1989 -1991. Lecturer, University of Minnesota Department of Ecology, Evolution and Behavior. Taught "Introduction to Ecology", a four credit course for university juniors and seniors. Course was taught twice a year to about 35 students each session. Ninety-six percent of all students who completed evaluations rated overall quality of instructor good or excellent, and 79% rated the course as one of the top one-fourth among courses taken at the University of Minnesota.
- Lecturer, University of Minnesota, Bell Museum of Natural History. Taught a five-week course "Ecology of Midwestern Forests" for museum members and the general public.
- 1995. Prepare and teach workshop in ecosystem management of forests for Department of Natural Resources employees, National Forest Service employees and private consultants in Michigan, Wisconsin and Minnesota. (With M.J. Baughman, J. Kotar, C. Locey).
- Instructor for Interagency Fire Management Course for National Park Service and National Forest Service employees.
- 1997-1999. Taught Fire Ecology and Management, a 2-credit course during spring quarter for Natural Resources Senior undergraduates and graduate students.
- 1997-2008. Instructor for 'Managing forest stands in changing landscapes', 'Natural disturbance in Midwestern Forests', 'Bigwoods Conservation and Deer', 'Range of Natural Variability in Great Lakes Forests', all continuing education courses for forest managers in the Upper Midwest sponsored by the College of Natural Resources's Center For Continuing Education.
- 2002 to date. Teach 'Forest Fire and Disturbance Ecology', a 3-credit course for senior undergraduates and graduate students.

Graduate Student Advising/Coadvising completed:

David Augustine, M.S. Wildlife Ecology (with P.Jordan), 1994-1997.

Meredith Cornett, Ph.D. Forest Ecology (with P.B. Reich and K. Puettmann) 1993-2000.

Martin Dovciak, Ph.D. Forest Ecology (With P Reich), 1995-2001.

Scott Weyenberg, M.S. Forest Ecology (With P. Reich), 1998-2001.

Michael Benedict, M.S. Forestry 1998-2001.
Smita Mehta, M.S. Conservation Biology (with A. Starfield), 2000- 2003.
Cindy Hale, Ph.D., Forest Ecology (With P. Reich), 1998-2003.
Julia Burton, M.S. Forestry (with Eric Zenner), 2002-2004.
Roy Rich, Forestry, Ph.D. (with P. Reich), 1999-2006.
Andy Holdsworth, Ph.D. Conservation Biology (with P. Reich), 2000-2006.
Jeri Peck, Ph.D. Natural Resource Science and Management (with Alan Ek), 2005-2007.

Graduate Student Advising/Coadvising in Progress:

Nick Danz, Ph.D. Natural Resource Science and Management (NRSM), 2005-
Ted Salk, Ph.D. NRSM (with S. Sugita), 2005-
Terry Serres, Ph.D. NRSM (with P.B. Reich), 2006-
Paul Ojanen, M.S., NRSM 2007-
Nick Fisichelli, Ph.D. NRSM (with P.B. Reich) 2007-
Chaina Bapikee, Ph.D., NRSM, 2008-

Other Graduate Student Committee Assignments Completed:

Mike Walters, Ph.D. Forest Ecology, Committee, final exam 1993.
Mark Tjoelker, Ph.D. Tree Physiology, Prelim committee 1993.
Kent Slaughter, M.S. Forest Soils, Committee, 1993-1994.
Steve Fettig, M.S. Wildlife Ecology, Committee, 1993-1995.
Cindy Hale, M.S. Forest Ecology, Committee 1993-1996.
Matt Duvall, M.S. Forest Soils, Committee 1994-1997.
David W. Peterson, Ph.D. Forest Ecology, Committee, 1994-1998.
Timothy Parshall, Ecology, Ph.D. Committee, final exam, 1998.
Cynthia Lane, Ph.D. Conservation Biology, Committee, final exam, 1999.
José-Luis Machado, Ph.D. Forest Ecology, Committee 1995-1998.
Amelia Lu, Forestry, Ph.D. Committee, 1998-1999.
Michael Counte, Forestry, M.S. Committee 1998-2000.
Robyn Flakne, Paleoecology, Ph.D. Committee, 1993-2000.
Dan Kneeshaw, Ph.D. Forest Ecology, Outside examiner, University of
Quebec at Montreal 2000.
Daren Carlson, M.S. Conservation Biology, Committee 1995-2001.
Kali Sawaya, M.S. Forestry, Committee, 1999-2000.
Steve Friedman, Ph.D. Forestry, Committee, 1995-2001.
Mike Tobin, Ph.D. Forestry, Committee, final exam, 2001.
Dave Lytle, Ph.D. Ecology, Evolution and Behavior, Committee 1998-2002.
S. Koh, Ph.D. Biology, Outside examiner, York University, Toronto,
Ontario, Canada, 2004.
Amy Harder, M.S. Forestry, Committee, 2002-2004.
Yu Wei, Ph.D. Forestry, Committee, 2001-2004.
Mark Seamans, Ph.D. Wildlife Ecology, committee, 2002-2005
Anne-Marie Hoskinson, Ph.D. Conservation Biology, committee, 2001-2006
John Wing, Ph.D. History, Prelim committee, 2007.
Scott Sell, Ph.D. Wildlife Ecology, Committee 1998-2007.

Other Graduate Student Committee Assignments in Progress:

Deb Olander, Ph.D. NRSM, Committee, 2001-

Evan Larson, Ph.D. Geography, Committee, 2006-
Grant Elliott, Ph.D. Geography, Committee, 2006-
Nathan DeJager, Ph.D. Ecology Evolution and Behavior, Committee, 2006-
Kris Johnson, Ph.D. NRSM, Committee, 2006-
Eric Henderson, Ph.D. NRSM, Committee, 2006-
Lorelle Berkeley, Ph.D. NRSM, Committee, 2007-
Christopher William, Ph.D. Geography, Committee, 2007-
Scott Loss, Ph.D. NRSM, Committee, 2008-
Kerrie Sendall, Ph.D., Plant Biology, Committee, 2008-

Undergraduate research:

Erica Johnson (UROP), 1998
Leah Rathbun (UROP), 2003
Rachel Nash (NSF REU), 2003

SELECTED CONSULTING

- USDA Forest Service, Chequamegon National Forest, Wisconsin. Served on committee to set up permanent monitoring system to determine future effects of forest management practices on population dynamics of rare/sensitive species. Developed silvicultural prescription for restoration of old- growth northern hardwood forests.
- 1993. Minnesota Department of Natural Resources. Assist in developing procedures for evaluating quality of old growth northern hardwoods stands.
- 1992-1994. Jaakko Pöyry Consulting, Inc., Generic Environmental Impact Statement on timber harvesting and forest management in Minnesota. Member of core GEIS group and study team on impact of timber harvesting on wildlife and biodiversity.
- Boise Cascade Corporation (with Westwood Associates). Documentation of historical natural disturbance regime in northern Minnesota Peatlands section.
- US Forest Service, Superior and Chippewa National Forests, MN. Disturbance and natural variability of ecosystems in northern Minnesota.
- 1999. Minnesota Forest Council. Report on natural range of variability in disturbance regimes for Northern Superior Uplands.
- 2000-2001. Foster-Wheeler Environmental Consulting, Inc., and USDA Forest Service, Superior National Forest. Environmental Impact Statement for proposed prescribed burning to mitigate the potential impact of large fires in the July 4th blowdown within the BWCAW.
- 2004. Minnesota Historical Society. Assist with design of new exhibit for the Grand Rapids, MN Forest History Center Museum.
- 2005-2006. Thunderhawk papermill expansion EIS for Blandin Paper Company.

SELECTED GRANTS

Approximately \$2.0 million as PI or Co-PI on grants in the last ten years, including 3 NSF grants, and \$650,000 in endowment money raised.

- Ecology and Succession of Boreal Forests. P.B. Reich, PI, and L.E. Frelich, co-PI. Total support: \$660,000 from *Wilderness Research Foundation*. Duration: July 1992-July 2007.

- Herbivory and regeneration of white cedar and white pine. Lee E. Frelich, PI, and P.B. Reich, co-PI. Total Support: \$44,000 from *MNDNR Division of Parks and Recreation*. Duration: April 1994 through June 1999.
- Deer browsing and maintenance of herbaceous plant in diversity in Minnesota forests. P. A. Jordan, PI, and J.Kitts, and L.E. Frelich, co-PIs. Total support: \$60,000 from *MN Agricultural Experiment Station*. Duration: April 1994 through March 1997.
- Mechanisms of patch maintenance in old-growth hemlock-hardwood forests. P.B. Reich, PI, and L.E. Frelich, K. Puettmann, and M.B. Walters, co-PIs. *National Science Foundation*, total support \$297,000. Duration: January 1995 through December 1997.
- Ecosystem management of Minnesota Forests: a stand-to-landscape approach to sustainability and biodiversity in harvested and unharvested forests. P.Reich, PI, and D.Grigal, L.Frelich, M. Bauer, and L.Queen, co-PIs. *National Council of the Paper Industry for Air and Stream Improvement*, \$200,000. Project period January 1995-December 1999.
- Center for Hardwood Ecology. Lee E. Frelich, PI; and P.B. Reich and M.B. Davis, co-PIs. *University of Minnesota, Office of the Vice President for Research, New Initiatives in Interdisciplinary research Program*, \$100,000. Project period July 1997- July 2000.
- Center for Hardwood Ecology, endowment fund. Lee E. Frelich, PI. Major benefactors: Bruce B. Dayton and Wallace C. Dayton, University of Minnesota 21st Century Fellowship matching fund. Total money raised to date: \$650,000.
- Center for Hardwood Ecology. Lee E. Frelich, PI. *Wood-Rill Foundation*, \$100,000, May 2001-Sept 2007.
- Natural regeneration process of white pine. Lee E. Frelich, PI. *Minnesota Department of Natural Resources* (from a legislative appropriation), \$160,000. Project period August 1997-June 30, 2001.
- European earthworm invasion and dynamics of hardwood forest understory communities. Lee E. Frelich, PI and Peter B. Reich, co-PI. *National Science Foundation*, \$331,000. Project period September 2000-August 2004.
- Spatial analysis of northern Minnesota landscapes. Lee E. Frelich, PI. *Minnesota Department of Natural Resources*, \$51,400. Project period May 2001-May 2003.
- Minnesota Worm Watch, Lee E. Frelich, PI, with Cindy Hale and Ken Gilbertson, Co-PIs. *National Science Foundation*, \$75,000, September 2005-December 2007.
- Research assessment for the development of principles for the removal of woody biomass from forests and brushland, Lee. E Frelich and Dean Current, Co-PIs. *University of Minnesota Initiative for Renewable Energy and the Environment*, \$191,572, September 2005-October 2006.

SELECTED PROFESSIONAL ACTIVITIES

- 1989 to date. Ad Hoc reviewer of manuscripts for *American Midland Naturalist*, *Biological Conservation*, *Biotropica*, *Bulletin of Torrey Botanical Club*, *Canadian Journal of Forest Research*, *Conservation Biology*, *Conservation Ecology*, *Ecological Applications*, *Ecology/Ecological Monographs*, *Ecology Letters*, *Ecoscience*, *Forest Ecology and Management*, *Forest Science*, *Journal of Ecology*, *Landscape Ecology*,

Landscape and Urban Planning, Natural Areas Journal, Oikos, Plant Ecology, Vegetatio. Total number of manuscripts reviewed to date: 103.

- 1991 to date. Ad Hoc reviewer of proposals for: *National Park Service Global Change Program, USDA Plant and Environment, National Science Foundation, NSERC (Canada), USGS.* Total number of proposals reviewed: 54.
- 1992-1996, 1998-2002, 2004-. Three five-year terms on *Commissioners Advisory Committee for Scientific and Natural Areas*, Minnesota Department of Natural Resources.
- 1996. Member, MNDNR's White Pine Regeneration Strategy Committee.
- 1996. Participant in Workshop on Large Infrequent Disturbances, at National Center for Ecological Analysis and Synthesis, Santa Barbara, CA.
- 1998-2000. Chair of Cooper Award Committee, *Ecological Society of America.*
- Principal organizer, 5th Eastern U.S. Old-Growth Forest Conference. Duluth, MN, June 10-12, 1999.
- 2004-2007, Associate Editor, *Forest Science*
- 2005 to date, Associate Editor, *Ecoscience*
- 2006, Co-organizer, with David Foster (Harvard Forest) of 'Alteration of North American forest communities by invasive invertebrates', an Organized Oral Session for the Ecological Society of America Meeting in Memphis, TN, August 7, 2006.
- 2008, Co-organizer, with Sue Galatowitsch, *Climate Change Adaptation and Biodiversity Conservation: A Minnesota Response*, on June 4-5 2008, Minnesota Landscape Arboretum.

BOARDS / PROFESSIONAL MEMBERSHIPS

- 1982 to date, Member, *Ecological Society of America*
- 1997 to date, Board of Directors, *Friends of Loring Park* (Minneapolis, MN)
- 2001-2006. Board of Directors, *Friends of the Boundary Waters Wilderness* (MN)
- 2006 to date, Advisory Council, *Friends the Boundary Waters Wilderness*
- 2003 to date, Vice President, *Eastern Native Tree Society*
- 2004 to date, Member, *Forest Guild*
- 2004 to date, Member, *Society of American Foresters*
- 2006 to date, Board of Directors, *Friends of Mohawk Trail State Forest* (MA)
- 2007 to date, Board of Directors, *Great River Greening* (MN)

HONORARY

- 1997. Minnesota DNR, *Department of Natural Resources Award*
- 2000. Minneapolis Park and Recreation Board, *Volunteer of the Year*
- 2005. University of MN, Colleges of Natural Resources and Agricultural Food and Environmental Science, *Dean's Special Merit Award for Faculty Teaching and Research*
- 2005-2008. Chair of MN Department of Natural Resources Commissioner's Advisory Committee on Natural Areas and Nongame Wildlife
- 2006. The Wilderness Society, *Sigurd Olson Memorial Lecturer*
- 2006. University of MN, College of Natural Resources, *Outstanding Achievement Award*

- 2006, 2007. University of MN, College of Food, Agriculture and Natural Resource Science, *Star Academic Professional Award*
- 2007 to date, President, *Friends of Loring Park*
- 2008. Izaak Walton League, Breckenridge Chapter, *Protection and Preservation of the Environment Award*

SELECTED MEDIA APPEARANCES

Over 150 appearances total where Frelich and/or graduate students are quoted. Most frequent topics include large scale wind damage to forests, European earthworm invasion, impact of deer on native plants, forest fires, old growth forests, and global warming.

Radio

- Minnesota Public Radio mid-morning call in shows, Morning Edition and Evening Edition news in Twin Cities, Duluth and Grand Rapids (numerous times)
- Grand Marais MN Public Radio (2 times)
- *Outdoor Talk* Radio Network
- CBC Ontario (2 times)
- CBS Radio *Osgood Files*
- WCCO Radio, Minneapolis

TV

- Kare 11 News, Minneapolis NBC affiliate (2 times)
- KSTP 5 Evening News, Minneapolis ABC affiliate (3 times)
- Fox 9 News, Twin Cities (3 times)
- WCCO TV channel 4, Minneapolis CBS affiliate (4 times)
- Twin Cities Public Television *Almanac* News Magazine (3 times)

Newspapers

- *Minneapolis Star Tribune* (9 times)
- *St. Paul Pioneer Press* (5 times)
- *Duluth News Tribune* (6 times)
- *Downtown Journal* (Minneapolis, 2 times)
- *Ely Timberjay* (3 times)
- *New York Times* (2 times)
- *Minnesota Daily* (2 times)
- *Wall Street Journal*
- *Boston Globe*
- *Minnesota Monitor* (an online Newspaper)

Magazines

- *National Geographic*
- *Orion Magazine*
- *Newsweek*
- *New Scientist*
- *Backpacker*
- *Minnesota Monthly* (Magazine from MN Public Radio)
- *Minnesota Conservation Volunteer* (5 times)

SELECTED PRESENTATIONS

Over 130 invited presentations given; 9 first author contributed papers at Ecological Society of America annual meetings.

- Invited talk at The White Pine Symposium, Duluth, MN.
- Invited departmental seminar at The Department of Biological Sciences, University of Calgary, Calgary Alberta, Canada.
- Invited talk at the Northeastern Old Growth Conference, Williamstown, MA.
- 1997. Invited talk at the Eastern Old-Growth Conference, Clarion Pennsylvania.
- 1997. Invited seminar at Montreal Botanical Garden and University of Quebec at Montreal.
- Invited talk at Managing to Create the Ancient Forest Conference, Lynchburg, VA.
- 2001. Keynote address, Canadian old growth, a Science perspective, Sault Ste. Marie, Ontario, Canada.
- 2002, 2004, 2007. Invited talks at Minnesota Shade Tree Conference, St. Paul, MN.
- 2003. Invited talk, Society of American Foresters, Buffalo, NY.
- 2004. Invited seminar at Iowa State University, Ames, IA.
- 2004. Invited plenary talk, North American Forest Biology Workshop, Houghton, MI.
- 2004. Invited talk at 6th Eastern Old-growth conference, Lake Winnepesaukee, NH.
- 2005. Invited keynote talk, Eastern Native Tree Society annual meeting, Holyoke, MA.
- 2006. Invited seminar, Michigan Tech University, Houghton, MI.
- 2006. Invited talk on global warming at The Science Museum of Minnesota, with Paul Douglas of WCCO TV and J Drake Hamilton of Fresh Energy.
- 2007, 2008. Invited presentations on fire and global warming, Bureau of Indian Affairs Midwestern Annual Forestry Meetings.
- 2007. Invited presentation on global warming to a joint meeting of the Minnesota State House and Senate, Capitol Building, St.Paul.
- 2007. Invited presentation on climate change with U.S. Representative Tim Walz and J. Drake Hamilton, Rochester MN.
- 2008. Invited presentation at *The Climate Change Forum*, Ely MN, with Arctic explorer Will Steger, MN Governor Tim Pawlenty, and U.S. Senator Amy Klobuchar.

PUBLICATIONS

Total of 74 publications (50 in peer reviewed journals, 6 books/book chapters, and 18 other) and 13 publications in preparation. Publications appear in 25 peer-reviewed journals with 43 coauthors. Top 1% of scientists in the world list, Science Citation Index, Essential Science Indicators, *Ecology and Environment* category (2007, 2008). ISI Citations: 193 for calendar year 2007; Career total, 1,459 (including books as of March 14, 2008); H index, 20; 4 papers with >100 citations; average 30 citations per paper.

PEER-REVIEWED JOURNAL ARTICLES, in order of publication

Lorimer, C.G. and L.E. Frelich. 1984. A simulation of equilibrium diameter distributions of sugar maple (*Acer saccharum*). *Bulletin Torrey Botanical Club* 111:193-199.

- Frelich, L.E. and C.G. Lorimer. 1985. Current and predicted long-term effects of deer browsing in hemlock forests in Michigan, USA. *Biological Conservation* 34:99-120.
- Frelich, L.E. and G.L. Martin. 1988. Effects of crown expansion into gaps on evaluation of disturbance intensity in northern hardwood forests. *Forest Science* 34:530-536.
- Lorimer, C.G., L.E. Frelich, and E.V. Nordheim. 1988. Estimating gap origin probabilities for canopy trees. *Ecology* 69:778-785.
- Frelich, L.E., J.G. Bockheim and J.E. Leide. 1989. Historical trends in tree-ring growth and chemistry across an air-quality gradient in Wisconsin. *Canadian Journal of Forest Research* 19:113-121
- Lorimer, C.G. and L.E. Frelich. 1989. A methodology for estimating canopy disturbance frequency and intensity in dense temperate forests. *Canadian Journal of Forest Research* 19:651-663.
- Bockheim, J.G., J.E. Leide, and L.E. Frelich. 1989. Red pine growth and chemical composition of foliage and forest floors across a precipitation-chemistry gradient in Wisconsin. *Canadian Journal of Forest Research* 19:1543-1549.
- Frelich, L.E. and C.G. Lorimer. 1991. Natural disturbance regimes in hemlock-hardwood forests of the Upper Great Lakes Region. *Ecological Monographs* 61:145-164.
- Frelich, L.E. and C.G. Lorimer. 1991. A simulation of landscape dynamics in old-growth northern hardwood forests. *Journal of Ecology* 79: 223-233.
- Lorimer, C.G., L.E. Frelich, and E.V. Nordheim. 1992. Forest-tree growth rates and probability of gap origin--a reply to Clark. *Ecology* 73: 1124-1128.
- Frelich, L.E., R.R. Calcote, M.B. Davis and J. Pastor. 1993. Patch formation and maintenance in an old growth hemlock-hardwood forest. *Ecology* 74: 513-527.
- Lorimer, C.G. and L.E. Frelich. 1994. Disturbance and eastern old growth. *Journal of Forestry* 92:33-38.
- Frelich, L.E., and L.J. Graumlich. 1994. Age class distribution and spatial patterns in an old-growth hemlock-hardwood forest. *Canadian Journal of Forest Research* 24:1939-1947.
- Frelich, L.E. 1995. Old forest in the Lake States today and before European settlement. *Natural Areas Journal* 15: 157-167.
- Frelich, L.E. and P.B. Reich. 1995. Spatial patterns and succession in a Minnesota southern-boreal forest. *Ecological Monographs* 65:325-346.
- Frelich, L.E. and P.B. Reich. 1995. Neighborhood effects, disturbance, and succession in forests of the Western Great Lakes Region. *Ecoscience* 2: 148-158.
- Tester, J., A. Starfield, and L.E. Frelich. 1996. Modeling for ecosystem management in Minnesota pine forests. *Biological Conservation* 80: 313-324.
- Lorimer, C.G. and L.E. Frelich. 1998. A structural alternative to chronosequence analysis for uneven-aged northern hardwood forests. *Journal of Sustainable Forestry* 6: 347-366.
- Frelich, L.E., P.B. Reich, S. Sugita, M.B. Davis, and S.K. Friedman. 1998. Neighborhood effects in forests: Implications for within stand patch structure and management. *Journal of Ecology*: 86: 149-162.
- Augustine, D., and L.E. Frelich. 1998. White-tailed deer impacts on populations of an understory forb in fragmented deciduous forests. *Conservation Biology* 12: 995-1004.
- Augustine, D., L.E. Frelich and P.A. Jordan. 1998. Evidence for development of alternative communities in an ungulate grazing system. *Ecological Applications* 8: 1260-1269.

- Frelich, L.E., and P.B. Reich. 1998. Disturbance severity and threshold responses in the boreal forest. *Conservation Ecology* [online]2(2):7.
- Romme, W., W. Everham, L.E. Frelich, M. Moritz, and R. Sparks. 1999. Are large infrequent disturbances qualitatively different from small frequent disturbances? *Ecosystems* 1: 524-534.
- Frelich, L.E. and P.B. Reich. 1999. Neighborhood effects, disturbance severity and community stability in forests. *Ecosystems* 2: 151-166.
- Cornett, M.W., L.E. Frelich, K.J. Puettmann, and P.B. Reich. 2000. Conservation implications of browsing by *Odocoileus virginianus* in remnant upland *Thuja occidentalis* forests. *Biological Conservation* 93: 359-369.
- Cornett, M.W., P.B. Reich, K.J. Puettmann, and L.E. Frelich. 2000. Seedbed and moisture availability determine safe sites for early *Thuja occidentalis* (*Cupressaceae*) regeneration. *American Journal of Botany*, 87: 1807-1814.
- Cornett, M.W., K.J. Puettmann, L.E. Frelich, and P.B. Reich. 2001. Comparing the importance of seedbed and canopy type in the restoration of upland *Thuja occidentalis* forests of northeastern Minnesota. *Restoration Ecology*, 9: 386-396.
- Dovciak, M., L.E. Frelich, & P.B. Reich. 2001. Discordance in spatial patterns of white pine (*Pinus strobus*) size-classes in a patchy near-boreal forest. *Journal of Ecology* 89: 280-291
- Reich, P.B., P.Bakken, D.Carlson, L.E. Frelich, S.K. Friedman, and D. Grigal. 2001. Influence of logging and fire on boreal forest biodiversity and productivity. *Ecology* 82: 2731-2748.
- Freidman, S.K., P.B. Reich, and L.E. Frelich. 2001. Multiple scale composition and spatial patterns of the northeastern Minnesota presettlement forest. *Journal of Ecology* 89: 538-554.
- Frelich, L.E., J-L. Machado, and P.B. Reich. 2003. Fine-scale environmental variation and structure of understorey plant communities in two old-growth pine forests. *Journal of Ecology* 91: 283-293.
- Frelich, L.E. and P.B. Reich. 2003. Perspectives on development of definitions and values related to old-growth forests. *Environmental Reviews* 11: S9-S22.
- Dovciak, M., P.B. Reich, and L.E. Frelich. 2003. Seed rain, safe sites, competing vegetation, and soil resources spatially structure white pine regeneration and recruitment. *Canadian Journal of Forest Research*, 33:1892-1904.
- Hale, C. M., L.E. Frelich and P.B. Reich. 2004. Allometric equations for estimation of ash-free dry mass from length measurements for selected European earthworm species (Lumbricidae) in the western Great Lakes region. *American Midland Naturalist*: 151(1): 179-185.
- Mehta, S., L. E. Frelich, M. T. Jones, and J. Manolis. 2004 . Examining the effects of alternative management strategies on landscape-scale forest patterns in northeastern Minnesota using LANDIS. *Ecological Modelling* 180: 73-87.
- Weyenberg, S.A, L.E. Frelich, and P.B. Reich. 2004. Logging versus fire: how does disturbance type influence the abundance of eastern white pine (*Pinus strobus*) regeneration? *Silva Fennica* 38:179-194.

- Dovicak, M., L.E. Frelich, and P.B. Reich. 2005. Pathways in old field succession to white pine: seed rain, shade and climate effects. *Ecological Monographs* 75:363-378.
- Hale, C. M., L. E. Frelich, P. B. Reich. 2005. Exotic European earthworm invasion dynamics in northern hardwood forests of Minnesota, U.S.A. *Ecological Applications* 15: 848-860.
- Hale, C. M., L. E. Frelich, P. B. Reich. 2005. Effects of European earthworm invasion on soil characteristics in northern hardwood forests of Minnesota, U.S.A. *Ecosystems* 8: 911-927.
- Frelich, L.E., M.W. Cornett, and M. A. White. 2005. Controls and reference conditions in forestry: The role of old growth and retrospective studies. *Journal of Forestry*: 103, 339-344.
- Frelich, L.E., C. M. Hale, S. Scheu, A.Holdsworth, L.Heneghan, P.J. Bohlen, and P.B. Reich. 2006. Earthworm invasion into previously earthworm-free temperate and boreal forests. *Biological Invasions* 8: 1235-1245.
- Hale, C.M., L.E. Frelich, and P.B. Reich. 2006. Changes in cold-temperate forest understory plant communities in response to invasion by European earthworms. *Ecology* 87: 1637-1649.
- Holdsworth, A.R., P.B. Reich, and L.E. Frelich. 2007. Regional extent of an ecosystem engineer: earthworm invasion in northern hardwood forests. *Ecological Applications*, 17:1666-1677.
- Holdsworth, A.R., L.E. Frelich, and P.B. Reich. 2007. Effects of earthworm invasion on plant species richness in northern hardwood forests. *Conservation Biology*, 21: 997-1008.
- Rich, R.L., L.E. Frelich, and P.B. Reich. 2007. Wind-throw mortality in the southern boreal forest: effects of species, diameter and stand age. *Journal of Ecology*, 95: 1261-1273.
- Peck, J.E. and L.E. Frelich. 2007. Moss harvest truncates the successional development of epiphytic bryophytes in the Pacific Northwest. *Ecological Applications*, 18: 146-158.
- Peck, J.E., H.M. Hoganson, P.S. Muir, A.R. Ek, and L.E. Frelich. 2007. Using Inventory Projections to evaluate management options for the nontimber forest product of epiphytic moss. *Forest Science* 54: 185-194.
- Hale, C. M., L.E. Frelich, P.B. Reich, and John Pastor. 2008. Exotic earthworm effects on hardwood forest floor, nutrient availability, and native plants: a mesocosms study. *Oecologia* 155: 509-518.
- Burton, J.I., L.E. Frelich and E.K. Zenner. 2008. Frost crack incidence in northern hardwood forests of the southern boreal north temperate transition zone. *Northern Journal of Applied Forestry*, in press.
- Benedict, M.A., and L.E. Frelich. 2008. Site factors and black ash tree-ring growth in northern Minnesota. *Forest Ecology and Management* 255:3489-3493.

BOOKS and BOOK CHAPTERS

- Davis, M.B., S. Sugita, R.R. Calcote, and L.E. Frelich. 1992. Effects of invasion by *Tsuga Canadensis* on a North American forest ecosystem. Pages 34-44 In: A. Teller, P.Mathy

- and J.N.R. Jeffers, Editors. *Responses of forest ecosystems to environmental changes*, Elsevier Applied Science, New York, New York, USA.
- Davis, M.B., S. Sugita, R.R. Calcote, J.B. Ferrari, and L.E. Frelich (Peer reviewed). 1994. Historical Development of alternate communities in a hemlock-hardwood forest in Michigan, USA. Pages 19-39 In: *Large-scale Ecology and Conservation Biology*. R.May, N.Webb, and P.Edwards, Editors. Blackwell, Oxford, England.
- Frelich, L.E. and P.B. Reich. 1996. Old growth in the Great Lakes Region. Chapter 11, pages 144-160, in Mary B. Davis, editor: *Eastern Old Growth*. Island Press, Washington, DC, USA.
- Frelich, L.E. and K.Puettmann. 1999. Restoration Ecology. Pages 498-524 in, M.L Hunter, Jr., Editor, *Maintaining biodiversity in forest ecosystems*. Cambridge University Press, Cambridge, England.
- Frelich, L.E. and P.B. Reich. 2002. Dynamics of old-growth oak forests. Pages 113-126 in, W.J. McShea and W.H. Healy, editors: *The ecology and management of oaks for wildlife*. Johns Hopkins University Press, Baltimore, MD, USA.
- Frelich, L.E. 2002. *Disturbance Regimes and Forest Dynamics*. Cambridge University Press, Cambridge, England.

OTHER PUBLICATIONS

- Frelich, L.E. 1979. Vascular plants of Newport State Park, Wisconsin. *Wisconsin Department of Natural Resources Research Report 100*. 34 pp.
- Phillips, M. (Editor). 1991. *Carbon dioxide budgets in Minnesota and recommendations on reducing net emissions with trees*. Minnesota Department of Natural Resources, Division of Forestry, St.Paul, MN, USA. 89 pages. (L.E. Frelich contributed about 12 pages of material on carbons pools of Minnesota and carbon fixation over time by shade trees and forest plantation).
- Frelich, L.E. 1992. The relationship of natural disturbances to white pine stand development. Pages 27-37 In: *White Pine Symposium Proceedings: History, Ecology, Policy and Management*. Eds. R. A. Stine and M.J. Baughman. St Paul, MN: Department of Forest Resources, College of Natural Resources and Minnesota Extension Service.
- Frelich, L.E. 1992. Predicting dimensional relationships for Twin Cities shade trees. Miscellaneous publication of the Legislative Commission on Minnesota Resources.
- Jaakko Pöyry Consulting, Inc. 1992a. *Forest Wildlife: A technical paper for a generic environmental impact statement on timber harvesting and forest management in Minnesota*. 210 pp. (L.E. Frelich provided technical editing and co-authored the document as part of a 5-member study team, document was peer reviewed).
- Jaakko Pöyry Consulting, Inc. 1992b. *Biodiversity: A technical paper for a generic environmental impact statement on timber harvesting and forest management in Minnesota*. 111 pp. (L.E. Frelich authored the document which was peer reviewed).

- Jaakko Pöyry Consulting, Inc. 1992c. *Global Atmospheric Change: A technical paper for a generic environmental impact statement on timber harvesting and forest management in Minnesota*. 30 pp. (L.E. Frelich authored the document).
- Jaakko Pöyry Consulting, Inc. 1994d. *Generic Environmental Impact Statement study on timber harvesting and forest management in Minnesota*. 500+ pages. (L.E. Frelich co-authored the document as part of the 4-member GEIS core group. The document was peer reviewed).
- Frelich, L.E. 1993. Fire policy in the BWCAW: discussion of some ecological issues. *BWCA Wilderness News*, Autumn 1993: 6-7.
- Frelich, L.E. 1996. Book review of "The Ecology of Fire", by R.J. Whelan. *Ecoscience* 3:244-245.
- White Pine Regeneration Strategies Work Group. 1996. Minnesota's White Pine--Now and for the Future. A Report to the Minnesota Department of Natural Resources. (Written by a group of 14, including L.E. Frelich).
- Frelich, L.E. 1999. Natural variability of forested ecosystems in northern Minnesota. A background paper for the forest planning process for Superior and Chippewa National Forests, Minnesota.
- Frelich, L.E. 1999. Range of variability in forest structure for the Northern Superior Uplands. A background paper for the forest planning process for Superior National Forest, Minnesota.
- Frelich, L.E. 2000. A preliminary ecological assessment of the July 4th blowdown in the BWCAW. A background paper for the USDA Forest Service, Superior National Forest.
- Reich, P.B. and L.E. Frelich. 2001. *Temperate deciduous forests*. Encyclopedia of Global Change.
- Frelich, L.E. and P.B. Reich. 2001. *Fire ecology, Forest, boreal, and Forest, temperate* (3 articles). Macmillan Reference USA, Biology for Students.
- Superior National Forest, USDA, Forest Service. 2001. Final Environmental Impact Statement, Boundary Waters Canoe Area Wilderness Fuel Treatments. Frelich wrote much of the Vegetation section of the EIS as a subcontractor with Foster-Wheeler Environmental, Inc.
- Frelich, L.E. 2008. Bicknell's Geranium. *Minnesota Conservation Volunteer* 71, No. 418, 72-73.

MANUSCRIPTS IN PREPARATION

- Frelich, L.E. and P.B. Reich. Will multiple environmental changes reinforce the impact of global warming on the prairie-forest border of central North America? Planned submission: *Science*.
- Frelich, L.E. and P.B. Reich. Wilderness conservation in an era of global warming and invasive species: a case study from Minnesota's Boundary Waters Canoe Area Wilderness. Planned submission: *Frontiers in Ecology and Environment*.
- Galatowitsch, S., Frelich, L.E., and L. Phillips. Native plant conservation and global warming in Minnesota. Planned submission, *Conservation Biology*.

- Frelich, L.E., D.C. Bragg, and R.T. Leverett. Errors in tree height measurement: a comparison of methods. Planned submission: *Ecological Applications*.
- Carlson, D.J., P.B. Reich, and L.E. Frelich. Fine-scale heterogeneity in overstory composition contributes to heterogeneity of wildfire severity in southern boreal forest. *Canadian Journal of Forest Research*, submitted.
- Frelich, L.E., J.A. Janssens and P.B. Reich. Productivity gradients, natural range of variability, and bryophyte conservation in the southern boreal forest.
- Holdsworth, A., P.B. Reich, and L.E. Frelich. Litter decomposition in earthworm-invaded northern hardwood forests: role of invasion degree and litter chemistry. *Ecoscience*, submitted.
- Holdsworth, A., L.E. Frelich, and P.B. Reich. Factors limiting understory recovery: deer, propagule supply, or invasive earthworms?
- Larson, E., Frelich, L.E., Reich, P.B., and K. Kipfmüller. A tree ring signal of exotic earthworm invasion in temperate hardwood forests, *Ecological Applications*, submitted.
- Rich, R.L., K.E. Sawaya, B.C. Loeffelholz, L.E. Frelich, P.B. Reich, and M.E. Bauer. Coupling high-resolution satellite imagery and field data to predict forest blowdown across a gradient of disturbance severity, in revision, *Remote Sensing of Environment*.
- Rich, R., L.E. Frelich, and P.B. Reich. Successional patterns influenced by large-scale blowdown in the southern boreal forest. Planned submission: *Ecosystems*.
- Burton, J.I., L.E. Frelich and E.K. Zenner. A comparison of forest structure in secondary and primary northern hardwood forests of northern Minnesota. Planned submission: *Journal of Ecology*.

REFERENCES

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