APPENDIX B. FULL LENGTH CURRICULUM VITAE FOR ALL LTRR FACULTY

Table of Contents

Core Faculty:

Joint Appointed and Adjunct Faculty:

CURRICULUM VITAE

Jeffrey S. Dean

PERSONAL DETAILS

Born 10 February 1939, Lewiston, Idaho

EDUCATION

1957-1958 University of Idaho

1958-1967 The University of Arizona

B.A. (Anthropology, minor in Geology), with highest distinction, 1961.

Ph.D. (Anthropology), 1967.

Dissertation: *Chronological Analysis of Tsegi Phase Sites in Northeastern Arizona*. Emil W. Haury, Dir.

PROFESSIONAL EXPERIENCE

2006- Agnese and Emil W. Haury Professor of Archaeological Dendrochronology, Laboratory of Tree-Ring Research; Professor of Anthropology, Department of Anthropology; Curator of Archaeology, Arizona State Museum, The University of Arizona.

2004-2005 Acting Director, Laboratory of Tree-Ring Research, The University of Arizona.

2000- Professor of Dendrochronology, Laboratory of Tree-Ring Research; Professor of Anthropology, Department of Anthropology; Curator of Archaeology, Arizona State Museum; The University of Arizona.

1998-2000 Professor of Dendrochronology, Laboratory of Tree-Ring Research; Professor of Anthropology, Department of Anthropology; The University of Arizona.

1997-1998 Professor of Dendrochronology, Laboratory of Tree-Ring Research; Research Professor of Anthropology, Department of Anthropology; The University of Arizona.

1996 Clements Endowed Professor, SMU-IN-TAOS, Fort Burgwin, New Mexico.

1985-1986 Senior Scientist, Center for Archaeological Investigations; Adjunct Professor of Anthropology, Department of Anthropology; Southern Illinois University, Carbondale, Illinois (on leave from The University of Arizona).

1977-1997 Professor of Dendrochronology, Laboratory of Tree-Ring Research, The University of Arizona.

1972-1977 Associate Professor of Dendrochronology, Laboratory of Tree-Ring Research, The University of Arizona.

1967-1972 Assistant Professor of Dendrochronology, Laboratory of Tree-Ring Research, The University of Arizona.

1966-1967 Instructor in Dendrochronology, Laboratory of Tree-Ring Research, The University of Arizona.

1964-1966 Research Associate, Laboratory of Tree-Ring Research, The University of Arizona.

1963-1964 Research Assistant, Laboratory of Tree-Ring Research, The University of Arizona.

1963 Research Associate, Laboratory of Tree-Ring Research, The University of Arizona.

1962-1963 Research Assistant, Laboratory of Tree-Ring Research, The University of Arizona.

1961-1962 Graduate Assistant in Research, Laboratory of Tree-Ring Research, The University of Arizona.

1961 Summer Assistant in Anthropology, Museum of Northern Arizona.

1960-1961 Student Assistant, Laboratory of Tree-Ring Research, The University of Arizona.

AWARDS, GRANTS, AND CONTRACTS

National Merit Scholarship Corporation scholarship, 1957-1961

Coinvestigator, "Southwest Paleoclimate," National Park Service, 1967-1968.

Coinvestigator, "Southwest Paleoclimate," National Park Service, 1968-1969.

Coinvestigator, "Southwest Paleoclimate," National Park Service, 1970-1971.

Coinvestigator, "Southwest Paleoclimate," National Park Service, 1974-1975.

Coinvestigator, "Southwest Paleoclimate," National Park Service, 1975-1976.

Faculty Associate, "Dendrochronology of Southwestern United States," National Science Foundation, 1968-1970.

Faculty Associate, "Dendrochronology of Southwestern United States," National Science

Foundation, 1972-1975.

Coinvestigator, "Long House Valley Archaeological Project," Wenner-Gren Foundation for Anthropological Research, 1972-1973.

Principal Investigator, "Long House Valley Archaeological Survey," The University of Arizona, Institutional Grant, 1973-1974.

Coinvestigator, "Reconstruction of Past Climatic Variability by Use of Tree-Rings, Pollen, and Other Proxy Series, as well as Climatic Data," Advanced Research Projects Agency, 1972-1973.

Coinvestigator, "Reconstruction of Past Climatic Variability by Use of Tree-Rings, Pollen, and Other Proxy Series, as well as Climatic Data," Advanced Research Projects Agency, 1973-1974.

Faculty Associate, "Prehistoric Cultural Adaptation in the Cedar Mesa Area, Southeast Utah," National Science Foundation, 1974-1975.

Principal Investigator, "Tree-Ring Dating of Alluvial Wood from Northern Arizona," United States Geological Survey, Energy Lands Program, 1974-1976.

Coinvestigator, "Dendrochronology of Walpi Pueblo," National Park Service, 1976-1977.

Coinvestigator, "Dendrochronology of Chetro Ketl, Chaco Canyon, New Mexico," National Park Service, 1978-1980.

Coinvestigator, "Dendroclimatic Reconstruction for the Southeastern Colorado Plateau," National Park Service, Eastern New Mexico University, Dolores Archaeological Project, 1979-1981.

Coinvestigator, "Southwestern Archaeological Tree-Ring Dating," National Science Foundation, 1985-1990.

Coinvestigator, "Dendroclimatic Characterization of Southwestern Paleoclimate During the Last 2,000 Years," National Science Foundation, 1989-1992.

Coinvestigator, "Southwestern Archaeological Tree-Ring Dating," National Science Foundation, 1990-1995.

Coinvestigator, "Dendroclimatic Characterization of Southwestern Paleoclimate During the Past 2,000 Years," National Science Foundation, 1992-1993.

Coinvestigator, "Early Holocene Dendrochronology and Calibration of ^{14}C Dating," National Science Foundation, 1993-1995.

Principal Investigator, "International Conference on Tree-Rings, Environment, and Humanity," National Science Foundation, 1994-1995.

Principal Investigator, "Southwestern Archaeological Tree-Ring Dating," National Science Foundation, 1995-1998.

Coinvestigator, "Doctoral Dissertation Research: Archives Analysis of the Development of Archaeological Tree-Ring Dating," National Science Foundation, 1996. Dissertation Research grant for Stephen E. Nash, Doctoral Candidate in Anthropology, The University of Arizona.

Principal Investigator, Paleoenvironmental Subcontract to Desert Archaeology, Inc., U. S. 89 - Wupatki to Fernwood Project sponsored by Arizona Department of Transportation, 1997-2000.

Principal Investigator, "Southwestern Archaeological Tree-Ring Dating," National Science Foundation, 1998-2001.

Coinvestigator, "Climate and Society on the Colorado Plateau, A.D. 500-1600," Santa Fe Institute, 1999.

Coinvestigator, "Climate and Society on the Colorado Plateau, A.D. 500-1600," National Science Foundation, 1999.

Coinvestigator, "Dendroarchaeology of the Navajo Occupation of the Southwest," National Science Foundation, 2000-2003.

Principal Investigator, "Southwestern Archaeological Tree-Ring Dating," National Science Foundation, 2001-2004.
Coinvestigator, "Absolute Chronology of the Pazyryk Culture and Climate Variability in the Altai Mountains Inferred from Tree Rings," National Science Foundation, 2002-2005.

Conivestigator, "Expanding Dendroarchaeology Into Northern Mexico," National Science Foundation, 2003-2004.

Coinvestigator, "Archaeological Sciences: An Integrated Approach to Graduate Training in Human Use of Ancient Landscapes Through Chronometry, Paleoecology, and Technology," National Science Foundation IGERT Program, 2003-2008.

Coinvestigator, "The Evaluation of Paleo Data to Determine Past, Present, and Future Hydrologic Variability in Arizona," University of Arizona Technology and Research Initiative (TRIF), Water Sustainability Program, 2003-2006.

Principal Investigator, "Southwestern Archaeological Tree-Ring Dating," National Science Foundation, 2004-2007.

HONORS AND HONORARY SOCIETIES

Certificate of Appreciation, Pueblo of Zuni, Zuni, New Mexico, 1990

Emil W. Haury Award for Research in the National Parks and Monuments of the Southwest, Southwestern Parks and Monuments Association, 1995

Lifetime Achievement Award, Society for American Archaeology, 2001

Byron S. Cummings Award, Arizona Archaeological and Historical Society, 2004

Alfred V. Kidder Award for Eminence in the Field of American Archaeology, American Anthropological Association, 2006

Elected a Fellow of the Arizona-Nevada Academy of Science, 2001

Member, Santa Fe Institute, 1996-1998

Phi Beta Kappa: Treasurer, Alpha of Arizona Chapter 1994-1997

Phi Kappa Phi

PROFESSIONAL SOCIETIES

American Anthropological Association, Fellow
American Association for the Advancement of Science, Fellow
    Section H, Nominating Committee, 1988-1991
Arizona-Nevada Academy of Science, Fellow
Arizona Archaeological and Historical Society
    President, 1968-1969
    Executive Council, 1968-1971
Museum of Northern Arizona
School of American Research

Society for American Archaeology
    Treasurer-Elect, 1976-1977
    Treasurer, 1977-1980
    National Archaeological Policy Information Committee, 1978-1979
    Distinguished Service Award Committee, 1981-1985
    Nominating Committee, 1994-1995
Society for Archaeological Sciences
    Vice President/President Elect, 1986-1987
    President, 1987-1988
Society of the Sigma Xi
Tree-Ring Society
    Secretary, 1974-1999
    Treasurer, 1988-1991
    Editor, *Tree-Ring Bulletin*, 1989-1999
    Associate Editor, *Tree-Ring Research*, 2001-

TEACHING

Teaching activities include: the team teaching of courses and seminars in archaeological tree-ring dating, dendrochronology, chronometry, and Anasazi archaeology; regular participation

in courses in Southwestern archaeology and dendrochronology; frequent presentations on archaeological tree-ring dating to geosciences and anthropology classes; the specialized instruction of individuals in the techniques of tree-ring dating and in the evaluation of archaeological tree-ring dates; and annual presentations to The University of Arizona Archaeological Field School. In addition, instruction in the theory and methods of dendrochronology has been presented at the archaeological field schools of Arizona State University, Eastern New Mexico University, the Field Museum of Natural History, the Museum of Northern Arizona, Northern Arizona University, Oberlin College, Prescott College, Southern Illinois University, Southern Methodist University, the University of Colorado, the University of Texas at Austin, UCLA, State University of New York at Binghamton, Northwestern University (Crow Canyon Campus), and Washington State University. Teaching activity also includes service on master's and doctoral students exam and thesis and dissertation committees in anthropology, archaeology and prehistory, geosciences, geography, and watershed management at The University of Arizona, Arizona State University, The University of New Mexico, the University of Sheffield (UK), Washington State University, and Southern Illinois University at Carbondale.

Formal courses taught:

Environmental History of the Southwest, 1999, 2000, 2001, 2003 with T. W. Swetnam, J. L. Betancourt, R. H. Towner, and P. R. Sheppard. (University of Arizona)

Seminar in Archaeological Chronometry, 1983, 1987, 1989, 1991, 1994, with J. J. Reid. (University of Arizona)

Introduction to Dendrochronology, 1984-1985, 1988-1989. (University of Arizona)

Seminar in Archaeological Chronometry, 1986. (Southern Illinois University)

Workshop in Archaeological Dendrochronology, 1986, 1996. (Southern Methodist University, Fort Burgwin Campus, New Mexico)

Archaeological Tree-Ring Dating, 1992. (University of Arizona)

Tree-Rings as Chronometers, 1992, 1995 with S.W. Leavitt. (University of Arizona)

Anasazi Archaeology, 1993, 1996, 1998, 2002, 2005 with E.C. Adams, A.J. Lindsay, Jr., and R.G. Vivian. (University of Arizona)

Colloquium in Dendrochronology (Journal Club), 1996, 1997, 1998 (University of Arizona)

Dendroarchaeology (field portion only), 2003-2006 with R. H. Towner (University of Arizona)

OTHER PROFESSIONAL ACTIVITIES

1965- Guest Lecturer, The University of Arizona Archaeological Field Schools,

Grasshopper, Pinedale, Winslow, and Tucson, Arizona.

1968 Participant, "Prehistoric Pueblo Social Organization," Advanced Seminar, School of American Research, Santa Fe, New Mexico.

1968 Guest Lecturer, Prescott College Archaeological Field School, Black Mesa, Arizona.

1969- Coinvestigator (with A. J. Lindsay and W. J. Robinson), Long House Valley Archaeological Project.

1970-1985 Research Associate, Museum of Northern Arizona, Flagstaff

1970 Consultant, Time-Life Films, New York City

1971 Guest Lecturer, Field Museum of Natural History Southwest Archaeological Expedition, Vernon, Arizona.

1971 Consultant, archaeological excavations by the Museum of Northern Arizona, Flagstaff.

1971 Consultant, USDA Forest Service Archaeological Project, Manti-La Sal National Forest, Utah

1971- Participant, Southwestern Archaeological Research Group (SARG).

1972 Participant, "Multi-Disciplinary Research at the Grasshopper Ruin, Arizona," a symposium at the 37th Annual Meeting of the Society for American Archaeology, Bal Harbour, Florida.

1972 Consultant, archaeological excavations by the Museum of Northern Arizona, Flagstaff.

1972-1975 Consultant, Cedar Mesa Archaeological Research Project, Museum of Northern Arizona, Flagstaff.

1973 Participant, "Chronology: Time as a Variable in the Conceptual Framework of Scientific Archaeology," a symposium at the 1973 Plains Anthropological Conference, Columbia, Missouri.

1973 Consultant, Central Arizona Ecotone Project, Southern Illinois University, Carbondale.

1974 Guest Speaker, Summer Seminar Series, Museum of Northern Arizona, Flagstaff.

1974-1975 Consultant, Johnson Canyon Archaeological Project, University of Colorado, Boulder.

1974 Consultant, Grand Gulch Archaeological Project, Museum of Northern Arizona, Flagstaff.

1974-1978 Consultant in Dendrochronology, U.S. Geological Survey Energy Lands Program Surficial Geology and Environmental Study of the Black Mesa and Four Corners Region of the Southwest, U.S. Geological Survey, Central Environmental Studies Branch, Flagstaff.

1975 Guest Lecturer, Arizona State University Archaeological Field School, Payson, Arizona.

1975 Participant, "Kayenta Anasazi Culture Change - Paleoenvironment," a working conference at Southern Illinois University's Black Mesa Archaeological Project Field Camp, Black Mesa, Arizona.

1975 Participant, "Regional Surveys in the Southwest: Results and Problems," a symposium at the 40th Annual Meeting of the Society for American Archaeology, Dallas, Texas.

1976 Participant in a working conference on research on Black Mesa, Arizona, Southern Illinois University's Black Mesa Archaeological Project Field Camp, Black Mesa, Arizona.

1976-1990 Chairman, Research Design Committee, Southwestern Anthropological Research Group.

1977-1985 Member, Advisory Committee, Walpi Archaeological Project, Museum of Northern Arizona, Flagstaff.

1978 Discussant, "Pueblo Cliff Dwellings," a symposium at the 43rd Annual Meeting of the Society for American Archaeology, Tucson, Arizona.

1978-1992 Member, Grasshopper Field School Advisory Committee, Department of Anthropology, The University of Arizona.

1979 Society for American Archaeology Representative, Workshop on the Calibration of the Radiocarbon Dating Time Scale, The University of Arizona, Tucson.

1979-1986 Cooperating Scientist, Black Mesa Archaeological Project, Southern Illinois University.

1980 Discussant, "The Dolores Archaeological Program, Southwest Colorado," a symposium at the 45th Annual Meeting of the Society for American Archaeology, Philadelphia, Pennsylvania.

1980-1983 Member, Search Committee for Research Professor of Dendrochronology, Laboratory of Tree-Ring Research, The University of Arizona, Tucson.

1980-1982 Peer Reviewer, Central Arizona Project, Tucson Aqueduct Archaeological Project. Arizona State Museum, Tucson.

1980-1993 Contributing Editor, Southwest U.S., *The Quarterly Review of Archaeology*.

1981 Organizer (with Richard W. Effland) and participant, "Research Perspectives in Kayenta Anasazi Archaeology," a symposium at the 46th Annual Meeting of the Society for American Archaeology, San Diego, California.

1981 Participant, "Radiocarbon Dating in Archaeology: Needs and Priorities in the 1980s," a conference held at the National Science Foundation, Washington, D. C.

1981 Peer Reviewer (with Jefferson Chapman and Douglas Schwartz) of the Dolores Archaeological Program. USDI Bureau of Reclamation, Cortez, Colorado.

1981 Chairman, "Flora, Fauna, Climate" session, Pecos Archaeological Conference, Fort Burgwin, New Mexico.

1981 Participant, "Anasazi Symposium," Mesa Verde National Park, Colorado.

1981 Participant, "Anasazi Cultural Developments and Paleoenvironmental Correlates," Advanced Seminar, School of American Research, Santa Fe, New Mexico.

1982 Participant, "Black Mesa Archaeological Project," Advanced Seminar, School of American Research, Santa Fe, New Mexico.

1982 Participant, "The Biogeography of the Black Mesa Anasazi," a symposium at the 47th Annual Meeting of the Society for American Archaeology, Minneapolis, Minnesota.

1982 Participant, Dolores Archaeological Program Modeling Seminar, Mesa Verde National Park, Colorado.

1983 Participant, USDA Forest Service, Southwestern Region Predictive Modeling Task Force Seminar, D. H. Lawrence Ranch, Taos, New Mexico.

1983 Participant, "A Cooperative Perspective on Southwestern Prehistory: SARG," a symposium at the 48th Annual Meeting of the Society for American Archaeology, Pittsburgh, Pennsylvania.

1983 Participant, "Dynamics of Southwestern Prehistory," Advanced Seminar, School of American Research, Santa Fe, New Mexico.

1984 Guest Lecturer, Mesa Verde Museum Association, Mesa Verde National Park, Colorado.

1984 Guest Lecturer, Crow Canyon Archaeological Center, Cortez, Colorado.

1984-1991 Consultant in Dendrochronology, Zuni Indian Tribe, New Mexico.

1985 Discussant, "Explaining Anasazi Cultural Change in the Dolores Valley, A.D. 600-980," a symposium at the 50th Annual Meeting of the Society for American Archaeology, Denver, Colorado.

1985 Participant, "The Case for Full-Coverage Regional Survey," a symposium at the 50th Annual Meeting of the Society for American Archaeology, Denver, Colorado.

1985 Guest Lecturer, Department of Anthropology, Washington State University, Pullman.

1986 Member, Review Panel for Weatherhead Visiting Scholarship Applications, School of American Research, Santa Fe.

1986 Member, Selection Committee for 1986-1987 Visiting Scholar, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

1986-1987 Consultant in Navajo Site Analysis, Black Mesa Archaeological Project, Center for Archaeological Investigations, Southern Illinois University, Carbondale.

1986 Participant in "Evolution of Agricultural Systems on Black Mesa, Northeastern Arizona," a symposium presented at the 51st Annual Meeting of the Society for American Archaeology, New Orleans, Louisiana.

1986 Leader, Workshop in Archaeological Sciences: Dendrochronology. Southern Methodist University, Fort Burgwin Research Center, Taos, New Mexico.

1986 Consultant in archaeology, Navajo Nation Department of Agricultural Resources, Long House Valley Reseeding Project.

1986 Participant, Fourth Annual Mogollon Conference, Tucson, Arizona.

1986 Participant, Third Anasazi Symposium, Monument Valley, Utah.

1986-1987 Chairman, Laboratory of Tree-Ring Research Assistant Professor Search Committee.

1987-1995 Archaeologist, Crow Canyon Archaeological Center, Four Corners Field Seminars.

1987 Participant, "Conference on Civilization and Rapid Climate Change," The Calgary Institute for the Humanities, University of Calgary, Calgary, Alberta, Canada.

1987-1991 Central Arizona Project Ad Hoc Committee for Cultural Resources, United States Department of the Interior, Bureau of Reclamation, Lower Colorado Region.

1988 Participant, "Changing Views of Hohokam Archaeology," Advanced Seminar, Amerind Foundation, Dragoon, Arizona.

1988 Discussant, "Of Time and the River: Chronology and Adaptation of the Rio Grande Anasazi," a symposium presented at the 53rd Annual Meeting of the Society for American Archaeology, Phoenix, Arizona.

1988 Chairman, "Dating Methods," session of volunteered papers presented at the 53rd

Annual Meeting of the Society for American Archaeology, Phoenix, Arizona.

1988 Participant, "Tools to Manage the Past: Research Priorities for Cultural Resources Management in the Southwest," USDA Forest Service Conference, Albright Employee Development Center, Grand Canyon National Park, Arizona.

1988 Participant, "Culture and Contact: Charles C. Di Peso's Gran Chichimeca," Advanced Seminar, Amerind Foundation, Dragoon, Arizona.

1988 Participant, "Household and Community in the Prehistoric Southwest," a symposium presented at the 21st Chacmool Conference, "Households and Communities," University of Calgary, Calgary, Alberta, Canada.

1989 Participant, "The Organization and Evolution of Prehistoric Southwestern Society," Advanced Seminar, School of American Research, Santa Fe, New Mexico.

1989-1991 Laboratory of Tree-Ring Research, Climatologist Search Committee.

1990 Participant, "Climate and Culture: The Response of Chaco Canyon People to Climate Change," symposium presented at the 1990 AAAS Annual Meeting, New Orleans, Louisiana.

1990 Participant, "Pueblo Cultures in Transition," conference at Crow Canyon Archaeological Center, Cortez, Colorado.

1990 Discussant, "Beyond the Black Sand: Seventy-Five Years of Archaeology in the Flagstaff Region," symposium presented at the 55th Annual Meeting of the Society for American Archaeology, Las Vegas, Nevada.

1990 Invited Speaker, Bell Museum of Natural History, University of Minnesota, Interdisciplinary Colloquium Series. Minneapolis.

1990 Participant, "The Organization and Evolution of Prehistoric Southwestern Society," Workshop, Santa Fe Institute, Santa Fe, New Mexico.

1990 Participant, "The Effects of Scale on Archaeological and Geological Perspectives," symposium presented at 1990 Geological Society of America Meetings, Dallas, Texas.

1991 Participant, "Collapse of Complex Societies," symposium presented at the 24th Chacmool Conference, University of Calgary, Calgary, Alberta, Canada.

1991- Arizona State Museum *Archaeological Series* Editorial Board.

1991-1998 University of Arizona Committee on Graduate Studies, Graduate College Representative on Doctoral Exams.

1991-2000 Consultant, USDI Bureau of Reclamation, Lower Colorado Region, Phoenix Area Office, Environmental Division, Cultural Resources Branch, Phoenix,

Arizona.

1992 Participant, "Resource Stress, Economic Uncertainty, and Human Responses in the Prehistoric Southwest," Workshop, Santa Fe Institute, Santa Fe, New Mexico.

1992 Discussant, "Cultural Dynamics of Precolumbian West and Northwest Mesoamerica," Advanced Seminar, Center for Indigenous Studies in the Americas, Phoenix, Arizona.

1992 Invited Speaker, "The Ancient Ones of the Four Corners Area," Southwest Institute Summer Lecture and Field Program, University of New Mexico, Albuquerque.

1992 Invited Speaker, informal discussion of recent advances in Southwestern paleoenvironmental reconstruction, School of American Research, Santa Fe, New Mexico.

1993 Invited Speaker, "Prehistoric Drought in the American Southwest and Its Impact on Anasazi Culture," University of Washington Quaternary Research Center. 1993 Winter Seminar Series: Rapid Climate Change

1993 Invited Speaker, "Implications of Pueblo and Navajo Wood Use for Archaeological Dating," University of Washington Department of Anthropology.

1993 Co-Organizer (with Ronald H. Towner), "Changing Perspectives of Navajo Culture: Recent Research on Navajo Archaeological Sites," symposium, 58th Annual Meeting of the Society for American Archaeology, St. Louis, Missouri.

1993 Participant, "The Current Status of Research in the American Southwest," invited symposium, 58th Annual Meeting of the Society for American Archaeology, St. Louis, Missouri.

1993 Participant, "Archaeological Science: Past Achievements/ Future Directions," invited symposium, 58th Annual Meeting of the Society for American Archaeology, St. Louis, Missouri.

1993 Invited Speaker, Mesa Verde Museum Association, Mesa Verde National Park, July and November.

1993 Invited Participant, Workshop on Long Tree-Ring Chronologies, Laboratory of Tree-Ring Research, The University of Arizona, Tucson.

1993-1996 Organizing, Program, and Editorial Committees, International Conference on Tree-Rings, Environment, and Humanity, Tucson, Arizona, 1994.

1994 Participant, "Human Impact on the Environment," symposium at the 1994 Southwest Symposium, Arizona State University, Tempe.

1994 Invited participant, "Climate Change in the Four Corners Region: Implications for Environmental Restoration and Land-Use Planning," Mesa State College,

Grand Junction, Colorado.

1994- Participant (with George J. Gumerman of the Arizona State Museum, Robert Axtell, Joshua Epstein, and Miles T. Parker of the Brookings Institution and Santa Fe Institute, and Alan C. Swedlund of the University of Massachusetts) in the Artificial Anasazi Project, an effort to apply agent-based computer modeling to understanding human subsistence and settlement behavior.

1994-1996 Member, Advisory Panel, Archaeometry Anthropology Program, National Science Foundation.

1995 Organizer, "Prehistoric Salado Culture of the American Southwest," Advanced Seminar, Amerind Foundation, Dragoon, Arizona.

1995 Participant, Culture Modeling Month, The Santa Fe Institute, Santa Fe, New Mexico.

1995 Invited Participant, Workshop on Past Response to Climate Change, Woodlands Conference Center and Rice University, Houston, Texas.

1995 Participant, "Examining the Course of Southwest Archaeology: The Durango Conference, September 1995," Fort Lewis College, Durango, Colorado.

1995 Invited Speaker, Fall Symposium, The Santa Fe Institute, Santa Fe, New Mexico.

1996 Invited Participant, "SARG (Southwestern Anthropological Research Group) Revisited," Roundtable Discussion, 1996 Southwest Symposium, Arizona State University, Tempe.

1996 Co-Organizer (with David E. Doyel) and Discussant, "Culture and Environment in the Ancient Southwest," Symposium, 61st Annual Meeting of the Society for American Archaeology, New Orleans, Louisiana.

1996 Participant, "Renewing the Archaeological Paradigm: The Impact of Big Federal Archaeology on Research and Methodology in the American Southwest," Symposium, 61st Annual Meeting of the Society for American Archaeology, New Orleans, Louisiana.

1996 Invited Participant, 1996 Culture Week, Santa Fe Institute, Santa Fe, New Mexico.

1996 Leader, Workshop in Paleoclimate Studies, Southern Methodist University SMU-IN-TAOS, Fort Burgwin, New Mexico.

1996 Teacher (with E. Charles Adams and R. Gwinn Vivian), "Anasazi Archaeology," Arizona Archaeological and Historical Society Fall Class, Tucson, Arizona.

1996-2000 Participant, Southwestern Studies Thematic Cluster for Undergraduates, The University of Arizona, Tucson.

1997 Participant, "Computing the Future of Culture: New Approaches to Understanding Cultural Dynamics," Invited Session, 96th Annual Meeting of the American Anthropological Association, Washington, D. C.

1997 Invited Participant, Workshop on Agent-Based Modeling of Small-Scale Societies, Santa Fe Institute, Santa Fe, New Mexico.

1997- Member, Archaeology Peer Review Team, Archaeological Consulting Services, Ltd., Arizona Department of Transportation State Route 88 Wheatfields Segment Project.

1998 Invited Speaker (with George J. Gumerman), "Creating Alternative Anasazi Culture Histories," Anthropology Lecture Series, Department of Anthropology, University of Arizona, Tucson.

1998 Invited Discussant, "Glass to Ceramics: Archaeometry in Archaeological Provenance and Technological Studies," Sponsored Symposium (Society for Archaeological Sciences), 63rd Annual Meeting of the Society for American Archaeology, Seattle Washington.

1998 Invited Participant, Sixth Annual Fruitland Data Recovery Program Conference, Farmington, New Mexico.

1998 Invited Speaker, University of Arizona Archaeological Field School, Homol'ovi Ruins State Park, Winslow, Arizona.

1998 Participant, Long-Term Human Dynamics Working Group Meeting, Santa Fe Institute, Santa Fe, New Mexico.

1998 Invited Participant and Session Moderator, Fall Meeting of the Arizona Archaeological Council, Flagstaff, Arizona.

1998 Invited Speaker (with George J. Gumerman), "Creating Anasazi in a Computer: New Ways of Exploring the Past," Arizona Archaeological and Historical Society, Tucson, Arizona.

1999 Teacher, "Archaeological Tree-Ring Dating," Arizona Archaeological and Historical Society Winter Class, Tucson, Arizona.

1999 Co-Organizer (with Malcolm K. Hughes and Henry F. Diaz), "Climate and Society on the Colorado Plateau, A.D. 500-1600," Workshop, Santa Fe Institute, Santa Fe, New Mexico.

1999 Invited Speaker, Sixteenth Annual PACLIM Workshop, Wrigley Institute for Environmental Studies, Two Harbors, Santa Catalina Island, California.

1999-2001 Invited Speaker, Arizona Archaeological Society Field School, Q Ranch, Arizona.

1999 Invited Speaker, Arizona Archaeological Society, Phoenix, Arizona.

1999 Participant, Artificial Anasazi Working Group, Santa Fe Institute, Santa Fe, New Mexico.

1999 Co-Organizer (with R. Gwinn Vivian, Carla R. Van West), "Economy and Ecology" session of the Chaco Synthesis Conference Series, Tucson, Arizona.

1999 Teacher, "Case Studies in Dendroarchaeology," Arizona Archaeological and Historical Society Winter Class, Tucson.

1999 Invited Speaker, "Tree-Ring Research," 260 Men's Club of Green Valley, Green Valley Arizona.

1999-2000 Laboratory of Tree-Ring Research, Assistant Professor Search Committee.

2000-2001 Laboratory of Tree-Ring Research, Assistant Professor Search Committee.

2000- Earth & Sky Science Advisors, Earth & Sky Radio Series.

2000 Invited Participant and Session Chair, "Paleoclimate and People Workshop," SMU-IN-TAOS, Fort Burgwin Campus, New Mexico.

2000 Invited Speaker, Arizona State Museum Homol'ovi Research Program, Tucson.

2000 Participant, Artificial Anasazi Workshop, Bayfield, Colorado.

2001 Helped prepare American Anthropological Association Congressional testimony in support of increased funding for the National Science Foundation in FY 2002.

2001 Invited Speaker, University of Arizona Archaeological Field School at the Marana Mound Complex, Tucson. "Archaeological Chronometry." 10 January.

2001 Invited Participant, Annual Meeting of the Society for American Archaeology. New Orleans, Louisiana, 18-22 April.

2001 Invited Participant, Chaco Symposium Working Group. New Orleans, Louisiana, 20 April.

2001 Invited Speaker, Arizona Archaeological Society Field School, Q Ranch, Arizona. "Paleoenvironmental Reconstruction." 19-20 June.

2001 Invited Participant, "Symposium on the Highway 89 Project Near Flagstaff." 2001 Pecos Conference, Flagstaff, Arizona. 10 August.

2001 Invited Participant, "Symposium Honoring the Work and Career of Robert Euler." 2001 Pecos Conference, Flagstaff, Arizona. 11 August.

2001 Invited Speaker, Seminar on Hohokam Archaeology, Arizona State University, Tempe. 13 September.

2001 Coauthor of paper presented at the Arthur M. Sackler Colloquium of the National Academy of Sciences, "Adaptive Agents, Intelligence, and Emergent Human Organization: Capturing Complexity through Agent-Based Modeling." Arnold and Mabel Beckman Center of the National Academy of Science and Engineering, Irvine, California. 4-6 October 2001 (presented by George J. Gumerman).

2001 Invited Participant, Mogollon-Zuni Seminar. Museum of Northern Arizona, Flagstaff. 14-19 October.

2002 Invited Participant, Chaco Symposium Capstone Conference Working Group. Tucson, Arizona, 12 January.

2002 Invited Participant, Artificial Anasazi Working Group Workshop. Amerind Foundation, Dragoon, Arizona, 13-15 January.

2002 Invited Participant, Migration and Corn Conference, Santa Fe Institute, Santa Fe, New Mexico, 17-21 January.

2002 Invited Participant, The Resilience of Past Landscapes Conference. Arizona State University, Tempe. 27 February-2 March.

2002 Invited Participant, Resilience and Hohokam Irrigation Systems Meeting. Arizona State University, Tempe. 28 March.

2002 Coauthor of paper presented at the "International Conference on Complex Systems," New England Complex Systems Institute, Nashua, New Hampshire, 9-14 June (presented by George J. Gumerman).

2002 Invited Participant, Hohokam Irrigation Systems Meeting. Arizona State University, Tempe. 26 June.

2002 Coauthor of paper presented at the "International Workshop on Self-Organization and Evolution of Social Behavior," Swiss Federal Institute of Technology Zürich, Centro Stefan Franscini, Monte Verita, Ascona, Switzerland, 8-13 September (presented by George J. Gumerman).

2003 Invited Participant, Social Dimensions of Hohokam Irrigation: Perspectives Across Cultures and Time. Arizona State University, Tempe. 27 February-01 March.

2003 Invited Participant, Colonialism and Culture Change at Zuni Pueblo, 1300-Present. Advanced Seminar, Amerind Foundation, Dragoon Arizona. 18-23 May.

2004 Invited Participant, Keet Seel Architectural Documentation Meeting. National Park Service, Navajo National Monument, Flagstaff, Arizona, 16 January.

2004 Invited Participant, Tree-Rings and Climate: Sharpening the Focus. The University of Arizona, Tucson, 6-9 April.

2004 Invited Speaker, Public Seminar on Drought, Chipeta Chapter of the Colorado Archaeological Society, Montrose. "How Bad Can It Get? A Paleoclimatic Perspective on the Current Southwestern Drought." 2 May.

2004 Invited Participant, IGERT Archaeology Summer Institute for Educators, The University of Arizona, Tucson, 7-18 June.

2004 Invited Participant, Keet Seel Architectural Documentation Project Field Orientation, USDI NPS Navajo National Monument, Arizona, 25-30 July 2004.

2004 Invited Discussant, Chronometry I Session, Archaeological Sciences in the Americas Conference, The University of Arizona, Tucson, 22-25 September.

2004 Invited Speaker, Changing Forms of Human Communities in the North American Southwest, A.D. 900 to 1300, Flagstaff Festival of Science, Museum of Northern Arizona, Flagstaff. "Kayenta Anasazi Communities from A.D. 900 to 1300." 2 October.

2004 Invited Participant, Commission IV Conference, Union Internationale des Sciences Prehistoriques et Protohistoriques, Santa Fe, New Mexico, 11-13 October.

2004 Invited Participant, Arizona Archaeological Council Fall Conference "Faint Traces of Past Places: The Archaeology of Low Visibility Groups in the Southwest, A.D. 1200-1900," Center for Desert Archaeology, Tucson, 22-23 October.

2004 Invited Participant, Hohokam Modeling Conference. Arizona State University, Tempe. 11 November.

2005 Invited Speaker, Ajo Chapter of the Arizona Archaeological Society, Ajo. 10 January.

2005 Invited Speaker, Arizona Archaeology Week Speakers Series, Tucson. 09 March.

2005 Invited Speaker, Old Pueblo Archaeological Center, Tucson. 04 April.

2005 Invited Participant, Special Topic Symposium "Anasazi Drought, Volcanoes, and Forest Fires: A Century of Dendrochronology in the Southwest. AAAS-SWARM 80th Annual Meeting, Tucson. 14 April.

2005 Invited Participant, University of Arizona/Statistical Research, Inc. Chronometry Discussion Panel, Tucson. 14 April.

2005 Invited Participant, Statistical Research, Inc. Archaeomagnetic Dating Planning Group, Tucson. 09 May.

2005 Invited Participant, IGERT Archaeology Summer Institute for Educators, The University of Arizona, Tucson, 13-24 June.

2005 Invited Participant, Pecos Archaeological Conference, White Rock, New Mexico. 11-14 August.

2005 Invited Participant, USGS Chaco Canyon Irrigation Workshop, Chaco Culture National Historic Park and Farmington, New Mexico. 24-27 August.

2005 Invited Speaker, Arizona Archaeological and Historical Society Archaeological Dating Course, Tucson. 15 October.

2005 Invited Participant, Laboratory of Tree-Ring Research Tree-Ring Day, Tucson. 31 October.

2006 Invited Participant, IGERT Archaeology Summer Institute for Educators, The University of Arizona, Tucson, 12-23 June.

2006 Invited Participant, USDI National Park Service Tonto National Monument Visitor Center Exhibits Partners Meeting - Archaeology and History, Tucson, 21 June.

2006 Invited Participant, American Quaternary Association Biennial Meeting, Bozeman, Montana, 17-20 August.

2006 Invited Participant, "Tree Rings, Kings, and Old World Archaeology and Environment:" Cornell Dendrochronology-Archaeology Conference in Honor of Peter Ian Kuniholm, Ithaca, New York, 3-5 November.

2006 Invited Participant, American Anthropological Association Annual Meeting, San Jose, California, 15-19 November.

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2000 Understanding Anasazi Culture Change Through Agent-Based Modeling. In "Dynamics in Human and Primate Societies: Agent-Based Modeling of Social and Spatial Processes," edited by Timothy A. Kohler and George J. Gumerman, pp. 179-205. *Santa Fe Institute Studies in the Sciences of Complexity*. Oxford University Press, Oxford.

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2000 The Surprisingly Deficient History of Archaeochronology. In *It's About Time: A History of Archaeological Dating in North America*, edited by Stephen E. Nash, pp. 2-11. The University of Utah Press, Salt Lake City.

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2006 Culture, Environment, and Adaptation: Perspectives from the Ancient Southwest. In *Environmental Change and Human Adaptation in the Ancient American Southwest*, edited by David E. Doyel and Jeffrey S. Dean, pp. 1-9. The University of Utah Press, Salt Lake City.

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Parks, James A., Jeffrey S. Dean, and Julio L. Betancourt
2006 Tree Rings, Drought and the Pueblo Abandonment of South-Central New Mexico in the 1670s. In *Environmental Change and Human Adaptation in the Ancient American Southwest*, edited by David E. Doyel and Jeffrey S. Dean, pp. xv-xvi. The University of Utah Press, Salt Lake City.

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2006 Ecology and Economy. In *The Archaeology of Chaco Canyon: An Eleventh-Century Pueblo Regional Center*, edited by Stephen H. Lekson, pp. 45-65. School of American Research Press, Santa Fe.

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Education Harvard College Cambridge, MA
A.B., Special Concentration in Environmental Science and Policy, **1992**

Columbia University New York, NY
Ph.D., Earth and Environmental Sciences, **1999**

Employment Columbia University Palisades, NY
Postdoctoral Research Scientist, Lamont-Doherty Earth Observatory, **1999-2000**
Adjunct Associate Research Scientist, Lamont-Doherty Earth Observatory, **2001-present**

Harvard University Cambridge, MA
NOAA/UCAR Postdoctoral Research Fellow, **2000-2001**

University of Arizona Tucson, AZ
Assistant Professor, Laboratory of Tree Ring Research (LTRR), **2001-present**
Joint Appointment, Dept. of Geosciences, **2003-present**
Joint Appointment, Dept. of Atmospheric Sciences, **2004-present**

Awards NASA Global Change Research Fellowship, **1993-1996**
NOAA/UCAR Climate and Global Change Postdoctoral Fellowship, **2000-2001**
NSF CAREER Grant, **2004-2008**

Service *Local:* Member, Institute for the Study of Planet Earth (ISPE), 2001-present; Member, USGS/UA Earth Surfaces Processes Research Institute (ESPRI), Biogeochronology working group, **2003**; Member, Graduate Interdisciplinary Degree Program in Global Change, **2004-present;** Public speaker, Tucson Jewish Community Center, Tucson Rotary Club, **2003, 2006;** Member, University Committee on Elections, **2003-2005;** Invited speaker, planning workshop to develop hydroclimatic reconstructions for decision support in the Colorado River Basin, Tucson, AZ, **2004;** Developer, instructor, advisor, Tohono O'odham Community College GEO101IN, an introductory course in meteorology and climatology infused with aspects of Tohono O'odham culture, Sells, AZ, **2005**; Member, Exploratory working group, proposed water-climate-ecological research in ``Biosphere 2, Version 3'', College of Science, UA, **2006**; Member, Graduate Interdisciplinary Degree Program in Statistics, **2006-present**.

National/international: Reviewer of journal manuscripts for Paleoceanography, Geophysical Research Letters, J. Climate, Climatic Change, Palaeo3, Science, Geology, Ecology, Nature, Geochemistry-Geophysics-Geosystems, J. Ocean Technology, Geochimica et Cosmochimica Acta, **2001-present**; Reviewer of

proposals for NSF, NOAA, NERC (United Kingdom), IODP, Washington Sea Grant, **2001-present**; Facilitator, NSF/NAGT 2003 Cutting Edge Workshops, ``Preparing for an Academic Career in the Geosciences: A workshop for graduate and post-doctoral fellows" (R.H. MacDonald and R.W. Dunbar, organizers), Stanford University, Stanford, CA, **2003**.

Teaching **(**Materials served from http://ic.ltrr.arizona.edu/ic/tp/)

NATS 101, Introduction to Global Change, a general education course for Honors College non-science majors, Fall **2001, 2002, 2003, 2005**.

ATMO/GEOS 513, ENSO: Past, Present, Future, a graduate seminar, Spring **2002, 2003, 2006**.

GEOS 595e Topics, Tools and Techniques in Paleoclimatic Research, a graduate seminar, Spring **2004**.

GEOS 597e, Spatiotemporal Data Analysis Workshop, a graduate course in statistics, Fall **2004, 2006**.

GEO101IN, Introduction to Weather and Climate, a lower division general education course infused with relevant aspects of Tohono O'odham culture, developed and taught at Tohono O'odham Commnuity College, Sells, AZ, Spring **2005**.

Publications Fairbanks, R.G., M.N. Evans, J.L. Rubenstone, R.A. Mortlock, K. Broad, M.D. Moore, and C.D. Charles, Evaluating climate indices and their geochemical proxies measured in corals, Coral Reefs, 16(Suppl.), S93-S100, **1997**.

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Bond, G. C., B. Kromer, J. Beer, R. Muscheler, M. N. Evans, W. Showers, S. Hoffman, R. Lotti-Bond, I. Hajdas, and G. Bonani, Persistent Solar Influence on North Atlantic Climate During the Holocene, Science, 294, 2130-2136, **2001**.

Evans, M.N., Alexey Kaplan and Mark A. Cane, Pacific sea surface temperature field reconstruction from coral delta 18O data using reduced space objective analysis, Paleoceanography, 17, DOI: 10.1029/2000PA000590, **2002**.

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Poussart, P.F., M.N. Evans and D.P. Schrag, Resolving seasonality in tropical trees: multi-decade, high-resolution oxygen and carbon isotopic records from Indonesia and Thailand, Earth and Planetary Science Letters, 218, 301-316, **2004**.

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Anchukaitis K. J., M. N. Evans, A. Kaplan, E. A. Vaganov, M. K. Hughes, H. D. Grissino-Mayer, M. A. Cane, Forward modeling of regional scale tree-ring

patterns in the southeastern United States and the recent influence of summer drought, Geophysical Research Letters, 33, L04705, doi:10.1029/2005GL025050, **2006**.

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Presentations

M.N. Evans, M.A. Cane, D.P. Schrag, A. Kaplan, B.K. Linsley, R. Villalba, and G.M. Wellington, Support for tropically-driven Pacific decadal variability based on paleoproxy evidence. Page 12 of Abstracts of the 18th annual PACLIM workshop, Pacific Grove, CA, March **2001** (submitted).

M.N. Evans, A. Kaplan, B.K. Reichert and M.A. Cane, Objective Interpretation of Paleoproxy Data, presentation at the NOAA Climate Change Data and Detection Review Panel Meeting, Chicago, IL, **2001** (Submitted).

M.N. Evans and D.P. Schrag, Tropical Isotope Dendroclimatology: Early Results. Addendum page of Abstracts of the First Annual Records in Tropical Systems (ARTS) Open Sciences Meeting, Noumea, New Caledonia, **2001** (Invited).

M.N. Evans, A. Kaplan, M.A. Cane and B.K. Reichert, Pacific Basin SST Field Reconstruction from Coral data: Update through October 2001. Page 34 of Abstracts of the First Annual Records in Tropical Systems (ARTS) Open Sciences Meeting, Noumea, New Caledonia, **2001** (Invited).

M.N. Evans, A. Kaplan, B.K. Reichert and M.A. Cane, Reconstruction Deconstruction: Toward better paleoclimate estimates, Eos. Trans. AGU, 82(47), Fall 2001 Meet. Suppl., Abstract GC21A-08, p. F300, **2001** (Submitted).

M.N. Evans, Paleoclimatology of ENSO, Dept. of Atmospheric Sciences, University of Arizona, **2002** (Invited).

M.N. Evans, Progress in Tropical Isotope Dendroclimatology (in Spanish), Civil Engineering Dept., University of Piura, Peru, **2002** (Invited).

M.N. Evans, Is Global Warming Changing ENSO?, Biosphere 2 Center, Oracle, AZ, **2002** (Invited).

M.N. Evans and A. Kaplan, Hadley and Walker Circulation variability based on 150 years of instrumental and proxy observations, Conference Proceedings, Hadley Circulation: Past, Present, Future, Honolulu, Hawaii, **2002** (Invited).

M.N. Evans, P.F. Poussart, S.R. Saleska, and D.P. Schrag, Tracking ENSO with tropical trees: Progress in stable isotope dendroclimatology, Eos, Trans. AGU, 83(47), Fall 2002 Meet. Suppl., Abstract PP51A-0302, **2002** (Submitted).

M.N. Evans, (1) Tracking ENSO with tropical trees: Progress in stable isotope dendroclimatology; (2) Valuing Biodiversity (a guest lecture in Geosciences 308, Global Change and Earth Sciences), Dept. of Geosciences, Oregon State University, **2003** (Invited).

M.N. Evans, Tracking ENSO with tropical trees: Progress in stable isotope dendroclimatology, Dept. of Geosciences, University of Arizona, **2003** (Invited).

M.N. Evans, A stable isotope approach to tropical dendroclimatology, Dept. of Geography, Univ. California-Berkeley, **2004** (Invited).

Reichert, B.K., M.N. Evans, A. Kaplan, E.A. Vaganov, M.K. Hughes, and M.A. Cane, A forward modeling approach to paleoclimatic interpretation of tree-ring data, Tree-Rings and Climate: Sharpening the Focus, Tucson, AZ, **2004** (Submitted).

M.N. Evans, P.F. Poussart, D.P. Schrag and S.R. Saleska, A stable isotope approach to tropical dendroclimatology, Tree-Rings and Climate: Sharpening the Focus, Tucson, AZ, **2004** (Submitted).

M.N. Evans, Progress in Tropical Isotope Dendroclimatology (in Spanish), Civil Engineering Dept., University of Piura, Peru, **2004** (Invited).

M.N. Evans, A stable isotope approach to paleoclimatic records from tropical trees, Dept. of Earth and Environmental Sciences, Columbia University/Lamont-Doherty Earth Observatory, **2004** (Invited).

M.N. Evans, (1) A stable isotope approach to paleoclimatic records from tropical trees; (2) Objective Interpretation of paleoproxy data for improved paleoclimatic reconstructions, Dept. of Geology and Geophysics, University of Minnesota, **2005** (Invited).

M.N. Evans, (1) A stable isotope approach to paleoclimatic records from tropical trees; (2) Objective Interpretation of paleoproxy data for improved paleoclimatic reconstructions, Dept. of Geosciences, Brown University, **2005** (Invited).

M.N. Evans, How can paleoclimatology inform climate change scenario policymaking?, Planning workshop to develop hydroclimatic reconstructions for decision support in the Colorado River Basin, Institute for the Study of Planet Earth, University of Arizona, **2005** (Invited).

M.N. Evans, P.F. Poussart, K.J. Anchukaitis, D.P. Schrag, Progress in stable isotope dendroclimatology, EOS Trans. AGU, 86(52), Abstract PP14B-06, **2005** (Invited).

M.N. Evans, Applications of process modeling in high resolution paleoclimatology, Dept. of Atmospheric Sciences/Laboratory of Tree-Ring Research, University of Arizona, **2006** (Invited).

M.N. Evans, (1) Applications of process modeling in paleoclimatology, ESSIC/Atmospheric and Ocean Sciences; (2) A stable isotope-based approach to proxy rainfall estimates from tropical trees, ESSIC/Geology, Univ. Maryland, **2006** (Invited).

M.N. Evans, A. Kaplan, J.E. Smerdon, M.K. Hughes, The spectral, multivariate and non-stationary nature of the paleoproxy--climate connection: Implications for paleoclimatereconstructions, Eos Trans. AGU, 87(52), Fall Meet. Suppl., Abstract U11B-02, **2006** (Submitted).

M.N. Evans, ``Tropical isotope dendroclimatology" - problems and possible benefits , keynote address to be delivered at Workshop on Stable isotopes and dendroclimatology - Current Status and Future Prospects, European Science Foundation, Julich , Germany (invitation accepted for 12-17 February **2007**).

Grants Collaborative Research: Objective Interpretation of Paleoproxy Data for Improved Multiproxy Climate Reconstructions, PIs: M.N. Evans, A. Kaplan, B.K. Reichert, M.A. Cane, NOAA, $109,043 (UA component), **2001-2003**.

Tracking ENSO with Tropical Trees: Isotope Dendroclimatology in Peru", PI: M.N. Evans, UA Faculty Small Grant Program: $9977, **2002-2003**.

Collaborative Research: Pilot Studies in Tropical Isotope Dendroclimatology", PIs: M.N. Evans and D.P. Schrag, NSF: $57,540 (UA Component), **2002-2004**.

Registros Dendrocronologicos e Impacto en Poblaciones Rurales de La Costa Norte del Peru Debidos a ``El Nino" , PI: R. Rodriguez; Co-PIs: B.R. Luckman, J.C. Atavena, M.N. Evans, Inter American Institute, $30,000 (no funds to UA), **2002-2003**.

Acquisition of an Analytical Facility for High Resolution Paleoclimatology, PI: M.N. Evans, Co-PIs: J.W. Beck, J.E. Cole, M.K. Hughes and J.T. Overpeck, NSF: $339,915, **2003-2006**.

CAREER: A Research and Education Program in Dynamical Paleoclimatology, PI: M.N. Evans, NSF: $416,151, **2004-2008**.

Developing and using realistic synthetic tree-ring data to constrain climate models", PI: M.K. Hughes, co-PI: M.N. Evans, NOAA, $189,142, **2006-2008**.

Spectral characteristics of climate proxies and their expression in climate field reconstructions, PIs: J.E. Smerdon, A. Kaplan, E.R. Cook and M.N. Evans, NOAA, $312,184, **2007-2010** (pending).

Paleo Reconstruction of Pacific-North American and North Atlantic-European climate variability, PI: A. Gershunov; Co-PIs M.N. Evans, M.K. Hughes, M.E.

Mann, NOAA, ~$450K, **2007-2009** (pending).

Model simulations of western conifer forest ecosystem response to forecasted 21st century climate change, DOE, $305,829, **2007-2010** (pending).

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EDUCATION

Ph.D. University of Arizona, Ecology & Evolutionary Biology, 2004
Doctoral studies, University of Washington, Division of Ecosystem Studies, 1995-97
M.A. Tufts University, Environmental Policy, 1980
B.A. Oberlin College, Interdisciplinary Studies, 1972

RESEARCH INTERESTS
Fire ecology, fire history, dendroecology, fire-climate relationships, ecological scale, restoration ecology.

PRIOR PROFESSIONAL EXPERIENCE
1998 – 2004 **Laboratory of Tree-Ring Research, University of Arizona.** Graduate Associate in Research.

1993 – 2002 **Society for Ecological Restoration. Executive Director** (1993 – 2000)**.** First director of the leading international organization dedicated to the science and practice of ecological restoration. Science & Policy Consultant (2000 – 02).

1993 – 94 **The Nature Conservancy of Arizona.** Field biologist and consultant for assessment of conservation status of rare plants in southern Arizona.

1984 – 93 **Center for Plant Conservation, Co-Founder and Executive Director.** Co-founder of first national organization dedicated to conservation of endangered plants, at Arnold Arboretum (Harvard University (1984-1991) and Missouri Botanical Garden (1991-present).

1980 – 84 **Cambridge Community Development Department, Energy Director.** Responsible for developing and managing $1.5 million residential energy conservation program.

AWARDS AND HONORS
2004 Center for Plant Conservation, STAR Award

2004 International Association of Landscape Ecology (US), Student Presentation Award, Honorable Mention

2003 Edward S. Deevey Award, Ecological Society of America

2001 – 02 Marshall Foundation Graduate Fellowship

2001 – 03 National Science Foundation, Doctoral Dissertation Improvement Grant

2001 – 02 Robert W. Hoshaw Scholar, Ecology & Evolutionary Biology, U. Arizona

1999 - 2000 William McGinnies Scholar, Arid Lands Studies, University of Arizona

1998 - 2001 Achievement Rewards for College Scientists (ARCS) Scholar
1996 Pinchot Institute for Conservation, U.S. Forest Service, Conservation Scholarship
1995 - 96 Lockwood Fellow, College of Forest Resources, University of Washington
1991 Fulbright Short-Term Scholars Award, Australian Fulbright Foundation
1991 - current Fellow, American Association for the Advancement of Science (AAAS)
1990 - 91 Arboretum Associate, Arnold Arboretum, Harvard University
1990 Plant Conservation Award, New England Wild Flower Society
1981 Governor's Award for Energy Conservation, Commonwealth of Massachusetts
1968 National Merit Finalist, National Merit Scholarship Board
1967 Institute in American Studies, St. Andrew's Academy, Boca Raton, FL

TEACHING, LECTURES, AND INTERNSHIPS

2005 - 6 Dendroecology (Geosciences/Ecology 497k597k) (with T. W. Swetnam)

2003 – 6 Lectures and seminars in restoration ecology and conservation biology, School of Natural Resources and Department of Ecology & Evolutionary Biology, University of Arizona

2002 University of Arizona, Environmental History of the Southwest (Teaching Assistant), P. Sheppard

2000 - 1 Columbia University, Earth Semester Mentor, BioSphere II, Oracle, AZ.

1999 - 2005 Dendroecology (lectures), EEB and LTRR, University of Arizona

1988 - 9 Conservation Botany, Arnold Arboretum of Harvard University

1984 - 90Tufts University, Adjunct Assistant Professor, Dept. of Urban and Environmental Policy:

Biological Diversity and Conservation Strategies
Introduction to Environmental Policy
Environmental Political Economy

1979 Science Instructor, Charles River Academy, Cambridge, MA

1979 - 80 The Nature Conservancy/Massachusetts Department of Environmental Management, Research Associate, Massachusetts Natural Heritage Program.

1978 EarthWatch, Inc./Massachusetts Department of Environmental Management.

1978 Research Assistant, Hummingbird Cay Field Station, Great Exuma, Bahamas

1978 Graduate Teaching Assistant, Environmental Planning and Design

1977 - 78 Lincoln Filene Center, New England Environmental Network, Tufts University.

ADVISORS AND PRIMARY COLLABORATORS

James Aronson, Centre National de la Recherche Scientifique, France
Craig Allen, USGS
Wallace Covington, Northern Arizona University
Brian Enquist, University of Arizona
Lisa Graumlich, Montana State University
Charles Halpern, University of Washington
Emily Heyerdahl, US Forest Service
Nathan McDowell, Los Alamos National Laboratory
Donald McKenzie, US Forest Service
Ann Lynch, US Forest Service
Constance Millar, US Forest Service

Carol Miller, Aldo Leopold Wilderness Institute

Norton Nickerson, Tufts University

Margaret Palmer, University of Maryland
Peter Raven, Missouri Botanical Garden
Robert Robichaux, University of Arizona
Melissa Savage, UCLA/Four Corners Institute
Thomas Swetnam, University of Arizona
Lawrence Venable, University of Arizona
Peter White, University of North Carolina
Joy Zedler, University of Wisconsin

SELECTED PUBLICATIONS

Books

Falk, D. A., M. A. Palmer, and J. Zedler (eds.). 2006. *Foundations of Restoration Ecology.* Island Press, Washington, DC.

Falk, D.A., C.I. Millar, and M. Olwell (eds.). 1996. *Restoring Diversity: Strategies for Reintroduction of Endangered Plants*. Island Press, Washington, DC.

Falk, D.A. and K.E. Holsinger (eds.). 1991. *Genetics and Conservation of Rare Plants*. Oxford University Press, New York.

Editing

1998 – current Co-founder and Associate Series Editor, *Science & Practice of Ecological Restoration*, Island Press and Society for Ecological Restoration. Titles to date:

Morrison, M. L. 2002. *Wildlife restoration: Techniques for habitat analysis and animal monitoring.*

Friederici, P. (ed.). 2003. *Ecological Restoration of Southwestern Ponderosa Pine forests*.

Chambers, J. C. and J. R. Miller. 2004. *Great Basin riparian areas: Ecology, management, and restoration.*

Guerrant, E. O., Jr., K. Havens, and M. Maunder. 2004. *Ex situ plant conservation: Supporting species survival in the wild*.

Temperton, V. M., R. J. Hobbs, T. Nuttle, and S. Halle. 2004. *Assembly rules and restoration ecology*.

Packard, S. and C. F. Mutel. 2005. *The tallgrass restoration handbook: For prairies, savannas, and woodlands.* 2nd Edition.

Falk, D. A., M. A. Palmer, and J. Zedler (eds.). 2006. *Foundations of Restoration Ecology.*

Apostol, D. and M. Sinclair. 2006. *Restoring the Pacific Northwest.*

1996 – 8 Section editor, Conservation and Ecological Management, *Encyclopedia of Ecology and Environmental Management*, P. Calow (ed.). 1998. Blackwell Science, Oxford, U. K.

Dissertation

Falk, D. A. 2004. *Scaling rules for fire regimes*. Ph.D. dissertation, Department of Ecology & Evolutionary Biology, and Laboratory of Tree-Ring Research, University of Arizona. Tucson. 305 pp.

Journals and book chapters

M. Lenart, F. N. Scatena, D. A. Falk, and W. R. Osterkamp. Tree uprooting and soil disturbance following a hurricane in Puerto Rico. *Journal of Tropical Ecology* (*in prep.*)

Falk, D. A., D. M. McKenzie, C. Miller, and A. E. Black. Toward a multi-scale understanding of fire in ecosystems. *Ecosystems* (*submitted*)

Falk, D. A. 2006. Process-centred restoration in a fire-adapted ponderosa pine forest. *Journal for Nature Conservation* 14: 140-151.

Falk, D. A., C. M. Richards, A. M. Montalvo, and E. E. Knapp. 2006. Population and ecological genetics in restoration ecology. *In* Falk, Palmer, & Zedler (eds.), *Foundations of Restoration Ecology.* Island Press, Washington, DC.

Falk, D. A., M. A. Palmer and J. Zedler. 2006. Integrating restoration ecology and ecological theory: A synthesis. *In* Falk, Palmer, & Zedler (eds.), *Foundations of Restoration*

Ecology. Island Press, Washington, DC.
Sisk, T. D., M. Savage, D. A. Falk, C. D. Allen, E. Muldavin, and P. McCarthy. 2005. A landscape perspective for forest restoration. *Journal of Forestry* 103 (6): 319-320.
Maunder, M., K. Havens, E. O. Guerrant, and D. A. Falk. 2004. *Ex situ* methods: A vital but underused set of conservation resources. Pp. 3-20 in Guerrant, E. O., K. Havens, and M. Maunder (eds.), *Ex situ plant conservation: Supporting species survival in the wild.* Island Press, Washington, DC.
Falk. D. A. and T. W. Swetnam. 2003. Scaling rules and probability models for surface fire regimes in Ponderosa pine forests. In *Fire ecology, fuel treatments, and ecological restoration*. US Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-P-29, pp. 301-317. Ft. Collins, CO.
Falk, D. A., E. Knapp, and E. O. Guerrant. 2002. An introduction to restoration genetics. Society for Ecological Restoration, Science & Policy Paper No. 1.
Allen, C. D., M. Savage, D. A. Falk, K. F. Suckling, T. W. Swetnam, T. Schulke, P. B. Stacey, P. Morgan, M. Hoffman, and J. T. Klingel. 2002. Ecological restoration of southwestern Ponderosa pine ecosystems: A broad framework. *Ecological Applications* 12(5): 1418-1433.
Thomas, S. C., C. B. Halpern, D. A. Falk, D. A. Ligouri, and K. A. Austin. 1999. Plant diversity in managed forests: understory responses to silvicultural thinning and fertilization. *Ecological Applications 9(3): 864-879.*
Falk. D. A. 1995. Restoration priorities on the landscape scale*. In* Peterson, D. and C. Klimas (eds.), *The role of restoration in ecological management*. Society for Ecological Restoration/Parks Canada.
Falk, D.A. and P. Olwell. 1992. Scientific and policy considerations in restoration and reintroduction of endangered species. *Rhodora* 94:287-315.
Falk, D.A. 1992. From Conservation Biology to Conservation Practice: Strategies for Protecting Plant Diversity. In Fiedler, P.L. and Jain, S.K. (eds.), *Conservation Biology*. Chapman & Hall, pp. 397-425.
Falk, D.A. 1992. Steps to the Formation of a National Plant Conservation Network. In Butler, G., L. Meredith, and M. Richardson (eds.), *Conservation of Rare or Threatened Plants in Australia*, Australian National Parks and Wildlife Service, Canberra, Australia, pp. 113-123.
Falk, D.A. 1992. In defense of endangered species. *Missouri Botanical Garden Op-Ed Service* 10/92.
Falk, D.A. 1990. Discovering the Future, Creating the Past: Some Reflections on Restoration. *Restoration & Management Notes* 8(2): 71.
Falk, D.A. 1990. A Restorative Strategy for Endangered Species. In J. Berger (ed.), *Environmental Restoration: Science of Strategies for Restoring the Earth,* pp. 328-334. University of California, Berkeley. Island Press, Washington, DC.
Falk, D.A. 1990. Endangered Forest Genetic Resources in the U.S.: Integrated Strategies for Conservation. *Forest Ecology and Management*. 35:91-117.
Falk, D.A. 1990. Integrated Strategies for Conserving Plant Genetic Diversity. *Annals of the Missouri Botanical Garden* 77:38-47.
Falk, D.A. 1990. The Theory of Integrated Conservation Strategies for Biological Diversity. In Leopold, D. (ed.), *Ecosystem Management: Rare Species and Significant Habitats*. Proceedings of the 14th Annual Natural Areas Conference, Natural Areas Association. State University Press of New York. New York State Museum Bulletin No. 471.
Falk, D.A. 1989. Conserving the native diversity of the U.S. *Conservation Digest* 2(5): 10.
McMahan, L. R. and D. A. Falk. 1989. The Center for Plant Conservation: Collaborating with the National Plant Germplasm System to Save Seeds for the Future. *Diversity* 5:43.

Falk, D. A. 1988. Testimony on the National Biological Diversity, Conservation and Research Act. U.S. House of Representatives, Committee on Science, Space, and Technology, Subcommittee on Natural Resources, Agricultural Research, and the Environment. 31 May.
Falk, D.A. 1988. The Center for Plant Conservation: Conserving the Native Plant Genetic Diversity of the United States. *Diversity* 16:20-21.
Falk, D.A. 1988. Helping to Ensure a Future in the Wild. *Plant Conservation* 3(2): 3.
Falk, D.A. and L.R. McMahan. 1987. Endangered Species: Managing for Diversity. *Natural Areas Journal* 8(2): 91-99.
Falk, D.A. 1987. Integrated Conservation Strategies for Endangered Plants. *Natural Areas Journal* 7(3): 118-123.
Falk, D. A. and P. S. Ashton. 1987. Testimony to the U.S. House of Representatives, Committee on Science, Space, and Technology, Subcommittee on Natural Resources, Agricultural Research, and the Environment
Falk, D.A. 1987. Endangered species conservation *ex situ*: The national view. In T.S. Elias (ed.), *Conservation and Management of Rare and Endangered Plants*. California Native Plant Society, Sacramento, CA.
Thibodeau, F.R. and D.A. Falk. 1986. Building a national *ex situ* network: The U.S. Center for Plant Conservation. In D. Bramwell, O. Hamann, V. Heywood, and H. Synge (eds.), *Botanic Gardens and the World Conservation Strategy*. International Union for Conservation of Nature, Academic Press, London.
Falk, D.A. and F.R. Thibodeau. 1986. Saving the Rarest. *Arnoldia* 46(3): 3-18.
Falk, D.A. Review of Mello, R.A., *Last Stand of the Red Spruce.* Island Press/Natural Resources Defense Council, Washington, D.C. *Conservation Biology* 3(1): 106-7.
Falk, D.A. and K.S. Walter. 1986. Networking to Save Endangered Plants. *Garden* 10(1): 2-10. Reprinted: *On the Fringe* (Native Plant Society of Northeastern Ohio) 6(2): 3-9, March/April 1987; *Wildflower* 2(4): 16-18, Autumn 1986.
Falk, D.A. and F.R. Thibodeau. 1985. A New Response to Endangerment. *The Public Garden* (Journal of the American Association of Botanical Gardens and Arboreta) 1(1):14-18.
Falk, D. A. 1984 – 1988. Reviews in *Choice* (American Library Association), eleven works.
Falk, D.A. and F.R. Thibodeau. 1983. Saving the Pieces. *Restoration and Management Notes* 2(2):71-72.
Falk, D.A. 1980. CAP-sized. *Working Papers*. November/December.
Falk, D.A. 1980. Labor Unions and Safe Energy. *Liberation News Service* 30 October.
Falk, D.A. 1979. A Delegation of Survivors: A Visit from Hiroshima/Nagasaki. *Boston Globe* 27 March.
Falk, D.A. 1979. Hiroshima: A Victim Remembers. *Boston Globe* 7 August. Interview with Shigeko Sasamori, distributed nationally by Associated Press.
Falk, D.A. 1978. Pilgrim's Progress and a Town's Taxes. *Boston Phoenix* 9 January.
Falk, D.A. 1978. *Final Report and Recommendations: Boston Harbor Islands State Park, Land Use Study*. Massachusetts Department of Environmental Management/Earthwatch, Inc.
Falk, D.A. 1978. Solar Energy in New England: A Mixed Forecast. *Boston Phoenix* 11 July. Cover story on regional solar energy development.
Falk, D.A. 1978. The Sleeper in Carter's Energy Plan. *Boston Phoenix* 28 February. Feature article on National Energy Plan. Reprinted: *Massachusetts Physician*, Spring 1978.

Technical reports

Falk, D. A., Mark K. Briggs, and William L. Halvorson. 1998. *The Riparian Restoration Ranking (R3) System*. Developed for the USDA Forest Service, Region III. Society for Ecological Restoration, Tucson, AZ.

Falk. D.A. and P. L. Warren. 1994. *Population Status and Monitoring Protocols for Rare Plants of the Coronado National Forest.* The Nature Conservancy/USDA Forest Service, Tucson, AZ

RESEARCH SUPPORT

Collaborative Forest Restoration Program, US Forest Service
Ecological Restoration Institute, Northern Arizona University
Ecology & Evolutionary Biology, University of Arizona
Ecosystem Interest Group, College of Forest Resources, U. Washington
Institute for the Study of Planet Earth
Joint Fire Science Program
Mazamas Research Committee
National Science Foundation
National Center for Ecological Analysis & Synthesis
Rocky Mountain Research Station, US Forest Service
T&E Foundation

SELECTED LECTURES AND KEYNOTE PRESENTATIONS

American Association for the Advancement of Science (AAAS)
Association for Fire Ecology
Center for Plant Conservation
Chicago Botanic Garden
Collaborative Forest Restoration Program, US Forest Service
Colorado State University
Columbia University, Lamont-Doherty Earth Observatory
Ecological Landscape Association
Ecological Restoration Institute, Northern Arizona University
Ecological Society of America
Fire Learning Network, The Nature Conservancy
Forest Guild
Gila River Riparian Restoration Forum
International Association for Landscape Ecology
International Institute for Tropical Forestry, Puerto Rico
Joint Fire Science Program
Mountain Climate Sciences Symposium
National Center for Ecological Analysis & Synthesis
National Fire Sciences Laboratory
New England Wildflower Society, Centennial Tour
Oklahoma State University
Pacific Southwest Research Station, US Forest Service
Society for Ecological Restoration
St. Albert Forum on Theology and Science, Newman Center, University of Arizona
University of Gröningen, Netherlands
University of North Carolina
USGS Wildland Fire Conference
USGS Western Mountain Initiative

RECENT TECHNICAL AND INVITED PRESENTATIONS (2003 – 2006 only)

2006 **Falk, Donald** and William Armstrong. "Process-centered restoration in a New Mexico ponderosa pine forest." Association of Fire Ecology, 3rd International Fire Ecology and Management Congress, San Diego, CA.

Falk, Donald. "Restoring fire as a landscape process: Some stochastic ideas." National Conference on Conserving and Restoring Frequent Fire Landscapes of the West: Linking Science, Collaboration and Practice. Northern Arizona University, Flagstaff.

Falk, Donald and William Armstrong. "Process-centered restoration in a New Mexico ponderosa pine forest." National Conference on Conserving and Restoring Frequent Fire Landscapes of the West: Linking Science, Collaboration and Practice. Northern Arizona

University, Flagstaff.

Falk, Donald and Thomas W. Swetnam**.** "Developing the western US fire history-climate network: Emerging questions, new potential". USGS, Western Mountain Initiative. Portland, OR.

Falk, Donald. "Pyrogeography: Understanding and restoring natural variability." US Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center, Placerville, CA.

Falk, Donald and Peter S. White**.** "Landscape ecology and fire." Rx510, Applied Fire Effects. National Advanced Fire & Resource Institute, Tucson, AZ.

2005 **Falk, Donald.** "Reference dynamics: Reconstructing ecological processes to restore natural variability." USGS Wildland Fire Symposium, Tucson, AZ.

Falk, Donald. Keynote presentation at 10th Anniversary of the Forest Guild. Santa Fe, NM.

Falk, Donald. "Reference dynamics and process-centered restoration to restore natural variability." Society for Ecological Restoration, Zaragoza, Spain.

Falk, Donald & Thomas Swetnam. "Cross-scale patterns of forest fire synchrony in southwestern North America". Invited paper in Organized Oral Session: "Spatial nonlinearities and cross scale interactions: Cascading effects in the Earth system." Debra Peters (Organizer). Ecological Society of America, Montréal, Québec, Canada.

Thomas Sisk, Melissa Savage, ***Donald Falk*** *& Patrick McCarthy. "Restoring the landscape scale of fire as an ecological disturbance process." Invited paper in Organized Oral Session: "Restoring and designing ecosystems for a crowded planet: provision of ecosystem services." M. Luisa Martinez and Margaret Palmer (Organizers). Ecological Society of America, Montréal, Québec, Canada.*

Falk, Donald. "Analytical foundations of scaling theory for fire history." Western Mountain Initiative-USGS, Northern Arizona University, Flagstaff.

Falk, Donald & W. Wallace Covington. "Emerging principles in ecological restoration." American Association for the Advancement of Science. 80th Southwest and Rocky Mountain Division, Tucson, AZ.

Christopher Baisan, Erica Bigio, **Falk, Donald**, Calvin Farris, Jose Iniguez, Ellis Margolis, Thomas Swetnam. " Using reconstruction of historical ecosystem processes to guide forest restoration." Invited presentation at: Southwest Fire Learning Network Workshop, Western New Mexico University, Silver City, NM.

Falk, Donald and Thomas Swetnam**.** " Forest restoration at Monument Canyon Research Natural Area." Invited presentation at: Annual meeting of the Collaborative Forest Restoration Program, Santa Fe, NM, January 2005.

2004 **Falk, Donald**. "Ten Years into the Future: Restoring Plant Diversity and Ecosystems." Janet Meakin Poor Research Symposium, Chicago Botanic Garden.

Falk, Donald. Keynote lecture at the 20th anniversary celebration, Center for Plant Conservation. Santa Barbara, CA.

Falk, Donald & Donald McKenzie. "A null model for the temporal distribution of surface fire events." Ecological Society of America, Portland, OR.

Falk, Donald. "Restoring the Earth: Can We Create New Nature?" St. Albert's Forum on Theology & Science, Newman Center, University of Arizona.

Falk, Donald. *"Event-area relationships: Scaling rules for fire regimes." Invited symposium presentation, Special Symposium: "Scaling laws in fire regimes: moving landscape fire history into the 21st century." Carol Miller & Donald McKenzie (Organizers). International Association for Landscape Ecology (US), Spring 2004.* ***Honorable Mention, Student Presentation Award.***

Falk, Donald. "Event-area relationships: Scaling rules for fire regimes." LTRR Seminar, University of Arizona.

Falk, Donald. *"A Just and Sustainable Landscape." Keynote presentation at "Balancing the Systems", Ecological Landscaping Association, 2004 Tenth Annual Conference, Boxborough, MA.*

2003 **Falk, Donald.** "Scaling rules for fire regimes: The event-area relationship: Scale dependence in the fire regime of a New Mexico ponderosa pine forest." Ecological Society of America, Savannah, GA. **Presentation given the ESA Edward S. Deevey Award.**

Falk, Donald. "Event-area relationships: Scaling rules for fire regimes." Seminar series, Laboratory of Tree-Ring Research, University of Arizona.

Falk, Donald. "Toward process-centered restoration: Temporal variability as the reference envelope." Southwest Fire Initiative Conference, Ecological Restoration Institute, Northern Arizona University, Flagstaff.

Falk, Donald. "Spatial and temporal variation in a New Mexico Ponderosa pine fire regime: Recent findings and analysis". Annual PI workshop, Joint Fire Science Program, Phoenix, AZ.

Falk, Donald. Lecture in Landscape Ecology, Department of Biology, University of North Carolina, Chapel Hill.

Falk, Donald. "Event-area relationships: Scaling rules for fire regimes." Seminar series, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY.

PEER REVIEW AND CONSULTING

Artic & Alpine Research
Blackwell Science
Cambridge University Press

Canadian Journal of Forest Research
Canadian Journal of Water Resources
Conservation Biology

Ecology

Ecological Applications
Foundation for Science (New Zealand)
Forest Ecology & Management
Island Press

Journal of Arid Environments

Journal of Vegetation Science

Landscape Ecology
MacArthur Fellows Program
National Science Foundation (US)
Oecologia
Oxford University Press
Restoration Ecology

1980 – 82 Wetlands consulting practice (MA)

BOARDS AND COMMITTEES

2003 - current	Office of the Governor, Arizona Forest Health Council
2001 – 2003	US Forest Service, Collaborative Forest Restoration Program, Technical Advisory Panel
1994 - current	Indigenous Peoples Restoration Network
1993 - 2003	Native Seeds/SEARCH, Board of Directors
1991 - 1994	IUCN Species Survival Commission, Reintroduction Specialist Group
1988 - 93	Society for Ecological Restoration, Madison, WI, Board of Directors
1988 - 89	IUCN/Botanic Gardens Conservation Secretariat, 2nd Botanic Gardens Congress
1986 - current	Tufts University, Environmental Resource Guide
1984 - 93	American Association of Botanical Gardens & Arboreta, Plant Conservation Committee

PROFESSIONAL MEMBERSHIPS
American Association for the Advancement of Science
Ecological Society of America
International Association for Landscape Ecology
Society for Conservation Biology
Society for Ecological Restoration
Tree-Ring Society

KATHERINE KRISTIN HIRSCHBOECK
Associate Professor of Climatology, Laboratory of Tree-Ring Research
Chair, Global Change Graduate Interdisciplinary Program
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CHRONOLOGY OF EDUCATION

Rosary College, River Forest, Illinois (attended 1969-70)
University of Wisconsin - Madison, B.S. in Geography, minor in Geology (1973)
University of Wisconsin - Madison, M.S. in Geography (1975) M.S. Thesis: *The response of flooding in the Upper Mississippi Valley to Twentieth Century Climatic Variations*, James C. Knox, thesis director.
University of Arizona, Ph.D. in Geosciences, minor in Geography (1985). Ph.D. Dissertation: *Hydroclimatology of flow events in the Gila River Basin*, Victor R. Baker and C.W. Stockton, dissertation co-directors

MAJOR RESEARCH & TEACHING FIELDS

Climatology -- with emphasis on variations in synoptic atmospheric circulation systems, the climatology of extreme events, and mechanisms of climatic change.
Hydroclimatology and surface water hydrology -- with emphasis on flood analysis, flood hydroclimatology, and the response of geomorphic and hydrologic systems to spatial and temporal variations in climate.
Dendroclimatology -- with emphasis on synoptic dendroclimatology and the link between atmospheric circulation processes and regional tree-growth patterns.

EMPLOYMENT

Associate Professor of Climatology, Laboratory of Tree-Ring Research 1991– present:
Chair, Global Change Graduate Interdisciplinary Program 2004 – present
University of Arizona Joint Appointments as Associate Professor:
Atmospheric Sciences (2004 – present)
Hydrology and Water Resources (1991 – present)
Geography and Regional Development (1992 – present)
University of Arizona Graduate Interdisciplinary Program (GIDP) Appointment
Arid Lands Resource Sciences GIDP (1992 – present)
Committee on Global Change for the Global Change GIDP (1992 – present)
Appointments at other Universities:
Assoc Prof, Dept of Geography and Anthropology, Louisiana State Univ. (1990 – 1991)
Asst Prof, Dept of Geography and Anthropology, Louisiana State Univ. (1985 – 1990)
Instructor, Dept of Geography and Anthropology, Louisiana State Univ. (1984 – 1985)
Visiting Assistant Professor, Department of Geography, Univ of Oklahoma (1984 – 1984)

HONORS AND AWARDS

Provost's General Education Teaching Award, 2003.
American Meteorological Society Editor's Award for the *Journal of Hydrometeorology*, 2001.
Nominated by Provost Sypherd to be the University of Arizona faculty representative to: *Project Kaleidoscope - Faculty for the 21st Century* (PKAL), a national network of science educators in higher education, 1996.

Warren Nystrom Award, 1987. Association of American Geographers, First Place. *(The Nystrom Award recognizes excellence in research. It is awarded for an outstanding written and oral presentation of a paper based on a recent dissertation)*

National Science Foundation Travel Award, 1989. (For scholarly exchange with Bulgarian geographers).

PUBLICATIONS

Referred Chapters in Scholarly Books

MacNish, R, **Hirschboeck, K**., Baird, K., and Maddock. T. *(in press)* Hydrology of the San Pedro River in *Ecology of Desert Riparian Ecosystems: The San Pedro River Example,* edited by Julie Stromberg and Barbara Tellman

Hirschboeck, K.K., Ely, L. and Maddox, R.A., 2000, Hydroclimatology of meteorologic floods, in Wohl, Ellen, ed, *Inland Flood Hazards: Human, Riparian and Aquatic Communities*, Cambridge University Press p. 39-72..

House, P.K., and **Hirschboeck, K.K**., 1997, Hydroclimatological and paleohydrological context of extreme winter flooding in Arizona, 1993: in Larson, R.A., and Slosson, J.E., eds., Storm-Induced Geological Hazards: Case Histories from the 1992-1993 Winter Storm in Southern California and Arizona: Boulder, Colorado, Geological Society of America Reviews in Engineering Geology, v. XI, p. 1-24.

Hirschboeck, K.K., Ni, Fenbiao, Wood, M.L., Woodhouse, C.A., 1996, Synoptic dendroclimatology: Overview and prospectus, in Dean, J.S., Meko, D.M. and Swetnam, T.W., eds., *Tree Rings, Environment, and Humanity*: Radiocarbon, pp. 205-223.

Hirschboeck, K.K., Floods, in *Encyclopedia of Climate and Weather*, Stephen H. Schneider, ed., 1996, Oxford University Press.

Hirschboeck, K.K., Runoff, in *Encyclopedia of Climate and Weather*, Stephen H. Schneider, ed., 1996, Oxford University Press.

Tobin, G.A.; Baumann, D.D.; Damron, J.E.; Emel. J.L.; **Hirschboeck, K.K**.; Matthews, O.P.; and Montz, B.E., 1989. Water resources research, *in* Willmott, C.J. and Gaille, G., eds., *Geography in America*, Merrill, 112-140.

Hirschboeck, K.K., 1988. Flood hydroclimatology, *in* Baker, V.R., Kochel, R.C. and Patton, P.C., eds., *Flood Geomorphology*, John Wiley & Sons, 27-49.

Hirschboeck, K.K., 1987. Catastrophic flooding and atmospheric circulation anomalies, *in* Mayer, L. and Nash, D.B., eds., *Catastrophic Flooding*, Allen & Unwin, 23-56.

Hirschboeck, K.K., 1987. Hydroclimatically-defined mixed distributions in partial duration flood series, *in* Singh, V.P., ed., *Hydrologic Frequency Modeling*, D. Reidel Publishing Company, 199-212.

Refereed Journal Articles

Hirschboeck, K.K. 2003. Respecting the drainage divide: a perspective on hydrological change and scale: *Water Resources Update*, no. 126.

Michaud, J.D, **Hirschboeck, K.K**. and Winchell, M., 2001. Regional variations in small-basin floods in the United States: *Water Resources Research*, v. 37, no. 5, 1405-1416.

Hirschboeck, K.K., 1999. A room with a view: some geographic perspectives on dilettantism, cross-training, and scale in hydrology: *Annals of the Association of American Geographers*, 89:696-706.

Moss, P., DeBres, K., Cravey, A., Hyndman, J. **Hirschboeck, K**. Masuci, M., 1999. Toward a feminist mentoring praxis: strategies for ourselves and others: *Journal of Geography in Higher Education*, 23 (3):413-427.

Faiers, G.E., Keim, B.D., and **Hirschboeck, K.K**., 1994, A synoptic evaluation of frequencies and intensities of extreme three- and 24-hour rainfall in Louisiana: *The Professional Geographer*, v 42, no. 2, 156-163.

Hirschboeck, K.K., 1991, Climate and floods, *in* National Water Summary 1988-1989 -- Hydrologic

Events and Floods and Droughts: *U.S. Geological Survey Water-Supply Paper 2375*, 67-88.

Lurry, D.L., Covay, K.J., **Hirschboeck, K.K**., and Bolourchi, Z., 1990, Louisiana water supply and use *in* National Water Summary 1987 -- Hydrologic Events and Water Supply and Use: *U.S. Geological Survey Water-Supply Paper 2350*, 275-282.

Breve, K.A., Bengtson, R.L., **Hirschboeck, K.K**. and Fouss J.L., 1990, Distribution and correlation of the rainfall erosion index in southern Louisiana. *Transactions of the American Society of Agricultural Engineers*, v.33, no. 2, 487-492.

LaMarche, V.C., Jr. and **Hirschboeck, K.K**., 1984. Frost rings in trees as records of major volcanic eruptions. *Nature*, v. 307, 121-126.

Hirschboeck, K.K., 1980. A new worldwide chronology of volcanic eruptions, (with a summary of historical ash-producing activity and some implications for climatic trends of the last one hundred years). *Palaeogeography, Palaeoclimatology, Palaeoecology*, v.29, 223-241.

Non-refereed Technical Reports & Proceedings Publications

Hirschboeck, K.K., 2000. Climate Diagnostics of Flooding in Arizona and Implications for Climatological Forecasts of Hydrologic Extremes in, *Proceedings of the Twenty-Fourth Annual Climate Diagnostics and Prediction Workshop*, Tucson, Arizona Nov 5-9, 1999, U.S. Department of Commerce, NOAA, pp. 367-370.

Hirschboeck, K.K. and Cruise, J.F. , 1994. Hydroclimatic Regionalization of Flooding Variability: a Combined Stochastic-climatic Approach: Final Report, U.S. Geological Survey Water Resources Research Grant Program (Section 105) 26 pp of text plus appendices.

Hirschboeck, K.K. and Coxe, M.F., 1991. Identification of High-risk Atmospheric and Surface Conditions For Urban Flash Flooding in Louisiana.. Project Completion Report, Louisiana Water Resources Research Institute Louisiana State University. 62 pp of text plus appendices

Hirschboeck, K.K. and Klimas, D.K., 1988. Intermittent Stream Classification Development Project. Final Report for Office of Water Resources, Louisiana Department of Environmental Quality, LDEQ Interagency Agreement No. 64004-87-02, 55 pp. of text; 104 pp. of appendices.

Southwest Environmental Service, 1980. Flood and Erosion Hazards in Tucson. Report prepared as part of a Floodplain Education Project supported by the National Science Foundation, Southwest Environmental Service, Tucson, Arizona, 116 pp. (**contributing author**)

Knox, J.C., Bartlein, P.J**., Hirschboeck, K.K**., and Muckenhirn, R.J., 1975. The response of floods and sediment yields to climatic variation and land use in the Upper Mississippi Valley. Institute for Environmental Studies Report No. 52, University of Wisconsin - Madison, 75 pp.

SCHOLARLY PRESENTATIONS

(selected invited presentations during last 6 years listed)

Invited Kansas State University, WESP Distinguished Lecture Series (two presentations) April 28, 2006.

Invited Colloquium Speaker, Department of Geography, Syracuse University, April 15, 2005.

Invited seminar and conference presentations on Tree Rings and Hydrology given at:

Salt River Project, Phoenix on February 18, 2003

UA Water Resources Research Center on March 25, 2003

The 71st Western Snow Conference, Scottsdale Arizona April 23, 2003

The American Society of Civil Engineers (ASCE) Section Meeting in Phoenix - October 3, 2003

Arizona Hydrological Society Annual Meeting, Tucson AZ Sept 17, 2004.

International Conference presentations:

"Frost Rings, Volcanism and Santorini Revisited -- New Data and Exploration of Mechanistic Linkages," & "Synoptic Dendroclimatology: Establishing Mechanistic Linkages between Tree-Rings, Climate and Atmospheric Circulation"6th International Conference on Dendrochronology, Quebec City, Quebec, Canada, 22-27 August, 2002.

Invited conference presentation to Arizona Floodplain Management Association on "Flood Hydroclimatology as a Tool for Flood Management." Nov 3, 2000.

Invited keynote presentation for US Bureau of Reclamation's Probabilistic Flood Hazard Workshop, June 23, 2000.

Invited speaker at Geological Society of America Pardee Keynote Symposium "Overlapping Scales and the Atmospheric Causes of Floods" (Pardee Keynote Symposia are high-profile GSA sessions given by invited speakers on significant scientific developments that impact our science.) Reno NV, Nov 2000.

GRANTS AND CONTRACTS

The Current Drought In Context: A Tree-Ring Based Evaluation of Water Supply Variability for the Salt-Verde River Basin" **P.I. K.K. Hirschboeck** , Co.I. D. M. Meko (2005-present) The Salt River Project. $277,184

Climate Assessment of the Southwest (CLIMAS), P.I. G. Garfin, Co-PIs B.Colby, A. Comrie, T. Finan. G. Frizvold, H. Hartmann, K. Hirschboeck, (2006-07 only) B. Morehouse, J. Overpeck, M. Wilder. Agency: NOAA. Hirschboeck portion of project: $22,500 Hirschboeck portion as Co-PI for final year of project)

Fractional Snow Cover Estimation in Complex Alpine Forested Environments Using Landsat and MODIS (2004-present) **Supervising P.I.** for graduate student E. Czyzowska. NASA Earth System Science (ESS) Graduate Student Fellowship $24,000/ year for 3 years.

A Tree-Ring Based Hydroclimatic Assessment of Synchronous Extreme Streamflow Episodes in the Upper Colorado and Salt-Verde River Basins (2003-2004) **P.I. K.K. Hirschboeck**, Co.I. D. M. Meko. The Salt River Project. $ 85,516.

A New Frost-Ring Initiative: Understanding the Mechanistic Basis for the Santorini Connection, (2003-2004) **P.I. K.K. Hirschboeck.** The Institute for Aegean Prehistory. $9,529.

Paleoflood Databank Development, Summer (2000), **PI: K.K. Hirschboeck**. Agency: *United States Bureau of Reclamation*. Three months duration. $6,940.

Paleoflood Databank Development Continuation, (2000-2001), **PI: K.K. Hirschboeck**. Agency: United States Bureau of Reclamation. One year duration. $23,457.

Structure & Dynamics of Rainstorms Inducing Floods in the Negev, (1999-2001), PI: Uri Dayan, Hebrew University, **Co- PIs**: Adina Margalit, **K.K. Hirschboeck**, David Sharon. Agency: *ILAC Research & Development Project* Proposal. $68,045 (UA portion $600)

River Flooding and Global Climatic Change: A Multi-Sensor Approach (1998-2001) PI: G.R. Brakenridge, **Co-PI: K. K. Hirschboeck,** V.R. Baker, L.A.K. Mertes, K. Prestegaard, W.S. Warner. Agency: NASA. $922,048. (UA portion $210,000)

Synoptic Dendroclimatology in Western United States (1997-1999) **PI: K.K. Hirschboeck**, Co-PI: D.M. Meko. NOAA Global Change Program. Two-year duration. $172,781.

Forecasting Major Flood Events in Arizona: A Pattern-Recognition Approach Combining Meteorology, Climatology, and Hydrology (1996-1998) **PI: K. K. Hirschboeck**, Graduate Student: Mark Love, HWR Department. Agency: NOAA - National Weather Service COMET/NWS Graduate Student Fellowship Program, $27,800.

A Global Paleoflood Database. *National Oceanic and Atmospheric Administration*, (1995 - 1997). **PI: K.K. Hirschboeck** Co-PI: Victor R. Baker, $98, 498.

Paleoflood Hydrology. *National Science Foundation*, (1993-1996). (PI: Victor R. Baker, **Co-PI: K.K. Hirschboeck)**, $224,288.

The Influence of rainfall Characteristics, Hydrologic Characteristics and Rainfall Measurement Strategy on the Accuracy of Flash Flood Forecasts. (1994-1996). PI: Soroosh Sorooshian, **Co-PI: K.K. Hirschboeck**, *National Science Foundation*, $229,010.

General Education Course Development for Earth System Science and Global Change. (1995-1997) PI: Lisa Graumlich, **Co-PI's**: Roger Bales, **K.K. Hirschboeck,** S.W. Leavitt *National Science Foundation*, Course and Curriculum Development Projects. Three years duration. $267,626.

A Scale-Sensitive Strategy for the Detection and Analysis of Changing Hydrologic Extremes in Response to Changing Global Climate Regimes. (1992-1993) **PI: K.K. Hirschboeck**, *Department of Energy*, National Institute for Global Environmental Change, Western Regional Center, $78,650.

Hydroclimatic Regionalization of Flooding Variability: A Combined Stochastic-Climatic Approach. *United States Geological Survey*, Water Resources Research Program, (1989-1994), **PI: K.K. Hirschboeck**, Co-PI: James P. Cruise, $158,147.

SERVICE: CITIZENSHIP

Extramural

Appointed to: National Research Council/National Academy of Sciences *Committee on Geography*, Board on Earth Sciences & Resources, Commission on Geosciences, Environment, & Resources (1997 – 2000)

Offices held: Association of American Geographers, Water Resources Specialty Group, Secretary/Treas. 1990-92; Chair, 1992-1994; American Quaternary Association, Councilor for Paleoclimatology, 1992-96.

Member of: American Meteorological Society (national and local chapters), Association of American Geographers, American Geophysical Union, American Institute of Hydrology; American Water Resources Association, Geological Society of America, The Tree-Ring Society, Phi Kappa Phi.

Editorial service: Reviewer of National Academy of Sciences reports; Reviewer of journal manuscripts for: Journal of Hydrology, Water Resources Research, International Journal of Climatology, Climatic Change, Climate Research, Bulletin of the American Meteorological Society, Arctic and Alpine Research, The Professional Geographer, Annals of the Association of American Geographers, Journal of Geography in Higher Education, Southeastern Geographer

Grant reviewing service for: NSF, NOAA Global Change Program, DOE WESTGEC

Advisory Panel service: National Science Foundation/Environmental Protection Agency Water and Watersheds peer review panel, July 14-17, 1996.

Intramural

University

Chair, Global Change Interdisciplinary Program (GCIDP) executive committee (2004- present)
Global Change Interdisciplinary Program (GCIDP) executive committee (2003-2004)
University-wide Committee on Global Change (1992-present)
ISPE Executive Committee member (2005- present)
Re-Envisioning TA Training Task Force (2006)
Learning Technologies Advisory Board (2005 - present)
ILC Responder Technology Evaluation Committee (2003)
ILC Management Team subcommittee on Classroom Computing (2003)
Review Board for TRIF water proposals (2004)
Honors College Forum Lunch Presentation (March 1, 2005)
Graduate College Graduate Student Orientation workshop on Mentoring (2000 - present)
General Education Assessment Committee (1999), Chair of Natural Sciences Team
Desert Laboratory Committee, College of Science (1993 - 1996)
Natural Science Core Curriculum Development Committee, College of Science (1995)
Search Committee for Desert Laboratory Faculty Position (1994)
Search Committee for School of Renewable Natural Resources Faculty Position (1995)
Office of International Programs Awards Committee

College of Science

College of Science Awards Committee (2003-2005)
College of Science Millennium Project Committee (2003-2004)
Committee to Recruit and Retain Women in Science, College of Science (1993 - 1995)
College of Science Awards Committee (2002-2004)
College of Science Millennium Project Committee (2003-2004)

Departments

LTRR

Chair, Five-Year Review Committee for LTRR Director (2005-06)
Post-Tenure Review Committee, Laboratory of Tree-Ring Research (2003 -present)
Tree-Ring Day Organizer and Coordinator (2005)
Tree-Ring Day Organizer and Coordinator (1998)
Climate data & Computer Support Committee, (1992-2005)
Curriculum Coordinator, Laboratory of Tree-Ring Research (2003 - present)
Promotion & Tenure Review Committee, Tree-Ring Laboratory (1993 – present)
Chair, Search Committee for faculty position, Laboratory of Tree-Ring Research (2000, 2001)
Search Committee member for faculty position, Laboratory of Tree-Ring Research (1999-2000)
International Tree Ring Conference Committee, Tree-Ring Laboratory (1993 -1994)

Other:

Search Committee member for faculty position, Geography & Regional Development (2006)
Physical Geography Committee, Department of Geography & Regional Development (1993-02)
Computer Technology Committee, Department of Geography & Regional Development (2003)

Katherine K. Hirschboeck is an associate professor of climatology at the Laboratory of Tree-Ring Research of the University of Arizona where she is involved in both teaching and research in climatology and climatic variability. She has interdisciplinary ties with the departments of Hydrology and Water Resources (Joint Appointment), Atmospheric Sciences (Joint Appointment), Geography and Regional Development (Joint Appointment), Geosciences, Office of Arid Lands Studies, and the Institute for the Study of Planet Earth. In addition, she holds an administrative position as Chair of the University of Arizona's Global Change Graduate Interdisciplinary Program.

Hirschboeck's research involves the climatology and hydroclimatology of extreme events – especially floods and paleofloods -- which she analyzes from the perspective of their meteorological and climatological causes and their long-term variability. She also uses synoptic climatology and dendroclimatology to link tree-ring responses to anomalous atmospheric circulation patterns. Hirschboeck's doctoral research examined the hydroclimatology and hydrometeorology of mixed statistical distributions in Arizona flood series, and her work received the Association of American Geographer's Warren J. Nystrom Award for best dissertation. Her research has progressed from the theoretical examination of the underlying atmospheric mechanisms that produce extreme hydroclimatological events in statistical time series, to analyses of the synoptic circulation patterns that produce frost rings and drought signals in tree-ring records, to new applied stakeholder-driven research on synchronous high and low extreme streamflow episodes detected from tree-ring reconstructions.

She is a member of the American Meteorological Society, the American Geophysical Union, the Association of American Geographers (for whom she served as the Water Resources Specialty Group secretary/treasurer and chair); the American Quaternary Association (for whom

she served as paleoclimatology councilor); the American Water Resources Association; and the Geological Society of America. She also served on the National Academy of Sciences *Committee on Geography*, Board on Earth Sciences and Resources, Commission on Geosciences, Environment, and Resources.

CURRICULUM VITAE

Malcolm K. Hughes

PERSONAL DETAILS

Born in Matlock, Derbyshire, England, 24th July 1943. US citizen.

EDUCATION

1965	B.Sc. (Honours) in Botany and Zoology, University of Durham, U.K..
1970	Ph.D., title of thesis: 'Investigations of the ecosystem energetics of an English woodland'. Supervisor; Dr. J. Phillipson, University of Durham.

EXPERIENCE

1968-69	Amanuensis, Research Fellow, Soil Biology Institute, University of Aarhus, Denmark
1969-71	University Research Fellow, Botany Department University of Durham.
1971-73	Lecturer II in Ecology, Biology Department, Liverpool Polytechnic (now Liverpool John Moores University).
1973-80	Senior Lecturer in Ecology, Liverpool Polytechnic.
1980-82	Principal Lecturer in Ecology, Liverpool Polytechnic.
1982-86	Reader in Ecology, Liverpool Polytechnic.
1986-1999	Director of the Laboratory of Tree-Ring Research, University of Arizona
1986-	Professor of Dendrochronology, University of Arizona
1992-	Professor of Watershed Management, School of Renewable Natural Resources, University of Arizona
1992-3	Visiting Fellow, Cooperative Institute for Research in Environmental Sciences, University of Colorado-Boulder

OTHER ACADEMIC ACTIVITIES

1978-85	External Examiner (CNAA) for degree studies in ecology, New College, Durham.
1980-86	External Examiner in ecology for Membership of the Institute of Biology, U.K.
1974-	Internal or External Examiner of various higher degree candidates of the Council for National Academic Awards and the Universities of Oxford, Durham, East Anglia, Ulster, Aix-Marseille, Amsterdam, Auckland, New Zealand, Queen's University Belfast, and of the Chinese Academy of Science.
1983-86	Responsible for development of higher education access for non-traditional students, Liverpool Polytechnic.
1983-86	Member, Combined Studies (Science) Board, Council for National Academic Awards, U.K.
1990	Member, University of Arizona review panel of Arid Lands Sciences academic program
1991	Chair, University review panel of Remote Sensing academic program

1991	Member, University review panel of Statistics Department
1996	Member, University review panel of Hydrology and Water Resources Department
1995	Member, Academic review panel for Quaternary Research Center, University of Washington
1994	Member, Search Committee, Dean of College of Science, University of Arizona
1995-	Member, Executive Committee, Institute for the Study of Planet Earth
1996-	Member, Executive Committee, Interdisciplinary Program in Global Change

HONORS

1998	Fellow, American Geophysical Union
1999-2000	Bullard Fellow, Harvard University
2006	Galileo Circle Scholar, University of Arizona

LEARNED SOCIETIES AND RELATED ACTIVITIES

	Member, British Ecological Society.
	Fellow, American Geophysical Union
	Member AAAS
	Member, International Tree-Ring Society
1972-78	Secretary, Energy and Production Biology Group, member of the meetings committee: British Ecological Society.
1978-82	Organizer, Global Dendroclimatology Workshop.
1982-85	Member, Terrestrial Life Sciences Grants Committee, Natural Environment Research Council, U.K.
1984-85	Member, Advanced Courses Review Panel, Natural Environment Research Council, U.K.
1984-6	Member, Council of the British Ecological Society.
1986-	Chair, Committee on Global Change, Faculty of Science, University of Arizona.
1988-1992	Chair, Coordinating Committee on Global Change, University of Arizona.
1988-	Member, U.S. National Committee for the International Union for Quaternary Research, National Research Council
1988	Member, working group meeting on 'Techniques for extracting environmental data from the past' set up by ICSU's Special Committee for the International Geosphere-Biosphere Programme
1988-1989	Member, Organizing Committee, 1989 Global Change Institute, Universities' Corporation for Atmospheric Research
1989-1992	Member, National Oceanographic and Atmospheric Administration (NOAA) Paleoclimatology Advisory Panel
1990	Member, Advisory Panel for Meeting on Earth System History, National Science Foundation.
1990-	Member, Technical Advisory Panel, Western Region of the National Institute on Global Environmental Change, US Department of Energy
1991	Organizer (with H.Diaz) Medieval Warm Period Workshop

1991-1993	Guest editor (with H.Diaz) special issue of *Climatic Change*.
1992-1995	Member, Board of Trustees, National Institute of Global Environmental Change (NIGEC)
1992-	Member, Scientific Council, Siberian International Centre for Ecological Research of Boreal Forests
1992-1994	Chair, program committee, International Conference on Tree Rings, Environment and Humanity, Tucson, Arizona, May 1994.
1993	Chair, search committee for new national Director, NIGEC
1993-	Member, executive committee, Institute for the Study of Planet Earth, University of Arizona
1993-1997	Member, Committee on Geophysical and Environmental Data, National Research Council
1995-1998	Member, Biometeorology Committee, American Meteorological Society (AMS)
1995-1998	Member, AMS Glossary revision committee
1996-1999	Member, joint working group between the PAGES core project of the International Geosphere-Biosphere Program and the CLIVAR project of the World Climate Research Program
1997	Member, United States delegation, conference of World Climate Research Program, Geneva, Switzerland.
1999-2005	Member, steering committee, National Science Foundation PARCS.
2000-2004	Vice-President, International Tree-Ring Society
2001-	Member, Advisory Board, *Dendrochronologia*
2003-4	Chair, Organizing Committee, international conference "Tree Rings and Climate: Sharpening the Focus", Tucson, Arizona, April 2004.
2005-6	Member, Advisory Committee, 7th International Conference on Dendrochronology, Beijing, PRC, June 2006.
2005-6	Member, International Scientific Committee, International Conference Climate changes and their impact on boreal and temperate forests, Ekaterinburg Russia, June 2006.

Reviews of grant proposals for NSF, NOAA, agencies in Austria, New Zealand, India.
Reviews of manuscripts for journal including Nature, Proceedings of the National Academy of Sciences (PNAS), Geophysical Research Letters, Canadian Journal of Forest Research, The Holocene, Quaternary Research, Journal of Climate, Climate Dynamics, Climatic Change.

SCHOLARLY PRESENTATIONS IN THE LAST FIVE YEARS

2001

Invited speaker at Pacific Climate Workshop, Asilomar, CA, March 19-21, 2001

Talk: Tree-ring records of drought in the West since A.D. 1000, M.K. Hughes and G. Funkhouser

Poster: Cell dimensions -a possible source of age-independent proxy data from larch tree rings. Irina P. Panyushkina, Malcolm K. Hughes, Eugene A. Vaganov and Martin A.R. Munro

Invited speaker at workshop on "Reconstructing Late Holocene Climate", Charlottesville, Virginia, April 18-20, 2001.

Talk: Drought in the western United States from millennial tree-ring records.

Invited speaker at HIGHEST II conference, Davos, Switzerland, June 24-28, 2001.

Talk: Frequency-dependent climate signal in upper and lower forest border trees in the mountains of Great Basin, M.K.Hughes and G. Funkhouser.

Invited speaker at Open Science Meeting of International Geosphere-Biosphere, Program, Amsterdam, Netherlands, July 9 – 13, 2001.

Talk: ENSO and decadal teleconnections in western North America during recent millennia. Malcolm K. Hughes, Fenbiao Ni and Gary Funkhouser

Invited Seminar, University of Bern, Switzerland, September 20, 2001

Title: ENSO and decadal teleconnections in western North America during recent millennia.

Major invited speaker, International Conference on Tree Rings and People, Davos, Switzerland, September 22-26.

Talk: Dendroclimatology – the state of the art

Posters: i) Atmospheric and oceanic indices since AD 1000 reconstructed from tree rings in the American Southwest. Fenbiao Ni, Malcolm K. Hughes and Gary Funkhouser

ii) A computer-assisted dendrochronology workstation: progress report. M.A.R.Munro, M.K.Hughes, R. Schowengerdt, S.Conner, J. Engle, G. Gopalan, J. Burns

iii) A 2,500-year long temperature-sensitive tree-ring record in far north-eastern Eurasia.

Hughes, M. K., Vaganov, E.A., Shiyatov, S.G., Touchan, R., Nuarzbaev, M. and Funkhouser, G.

iv) The Tunguska event in 1908: evidence from tree-ring anatomy. P. Silkin, V.D. Nesvetailo, E.A. Vaganov, M.K.Hughes

2002

Invited speaker, Pacific Climate Workshop, Asilomar, CA, March 3 – 3, 2002

Talk: Frequency-dependent climate signal in upper and lower forest border trees in the mountains of Great Basin, M.K.Hughes and G. Funkhouser.

Invited Speaker, InterAmerican Institute for Global Change CRN workshop, Oaxaca, Mexico, April 18-22

Talk: ENSO and decadal teleconnections in western North America during recent millennia. Malcolm K. Hughes, Fenbiao Ni and Gary Funkhouser

Invited seminars, Yale University, New Haven, CT, September 22 – 23.

Invited speaker, Sierra Nevada Science Symposium, North Tahoe, CA, October 7 – 10

Talk: Interannual to Century-scale Climate Variability in Western North America

Invited speaker, Workshop on Historical Climate Reconstruction over East Asia, Beijing, China, October 14-16, 2002,

Talk: Just Over the Horizon: Climate Variability at Multi-decadal to Century Time Scales From Tree Rings.

Invited speaker, Institute of Earth Environment of the Chinese Academy of Sciences, X'ian, China, October 18, 2002.

Talk: Just Over the Horizon: Climate Variability at Multi-decadal to Century Time Scales From Tree Rings.

Invited speaker, Paleoclimate Workshop, Ehime University, Matsuyama, Japan, Nov. 28-30

Talk: Some thoughts on IGBP PAGES.

2003

Invited speaker, CALFED conference Sacramento, CA, Jan 14-16 2003

Talk: The record of natural climate variability over the Central Valley watershed; M.K.Hughes and D.Meko

Invited speaker Joint Assembly European Geophysical Society/American Geophysical Union, Nice, France, April 6-11

Talk: Changing climate response of high-elevation tree rings in semi-arid mountains – implications for paleoclimate reconstruction; M.K.Hughes, G.Funkhouser, M.Salzer and Fenbiao Ni

Seminar, Max Planck Institute for Biogeochemistry, Jena, Germany, August 13:

Title, "Just Over the Horizon: Climate Variability at Multi-decadal to Century Time Scales From Tree Rings."

Keynote Speaker, Conference on "Dendrochronology: Achievements and Perspectives" Institute of Forest, Krasnoyarsk, Russia, October 26-30.

Title "Some thoughts on dendroclimatology".

Invited speaker, PAGES/CLIVAR International Workshop on Drought, Tucson, AZ, November 18-21

Talk: SW United States Drought: A Tree-Ring Perspective. M.K. Hughes, N. Graham, D.Meko, Fenbiao Ni, G. Funkhouser.

Contributed paper, AGU Fall Meeting, San Francisco, CA, December 12.

Talk: Global Multidecadal to Century-Scale Climate Oscillations During the Last 1000 Years; M.K.Hughes, Fenbiao Ni, M.Mann, J.Park

2004

Invited lecture, Environmental Sciences Department, University of Virginia, March 18.

Talk:The wise use of tree-rings as records of past climate: myths and distractions.

Conference on "Tree-Rings and climate: sharpening the focus", Tucson, AZ, April 7-9

Talk: There were optimists and there were pessimists – a charge to the meeting. M.K.Hughes

Talk: A forward modeling approach to paleoclimatic interpretation of tree-ring data. Bernhardt Reichert, Michael Evans, A. Kaplan, E.A.Vaganov, M.K.Hughes and M.A.Cane

Talk: Dendroclimatology in the Near East. Ramzi Touchan, M.K. Hughes, G. Funkhouser, N. Erkan and Ü. Akkemik

Talk: Tree ring reconstruction of the entire Pacific Sea surface temperature field. Sasha Gershunov, M.N. Evans, M.K. Hughes and A. Kaplan

Talk: Increasing Tropical Pacific SSTs at the transition into the Little Ice Age. Nick Graham, M.K. Hughes, K.Cobb, L.J. Graumlich, D. Kennett, J. Kennett and L. Stott.

Poster: A Forward-Modeling Approach to Assessing Proxy-Climate Stability in the southeastern United States. Kevin Anchukaitis, M.N. Evans, B.K. Reichert, A. Kaplan, E.A.Vaganov, M.K.Hughes and M.A. Cane

Poster: A comparison of regional curve standardization and a traditional standardization technique for recovering low frequency climate information from simulated tree-ring data. Kurt Kipfmueller , M.K. Hughes and D. M. Meko

Poster: Inferences on past temperature from millennial-length upper forest border tree-ring chronologies in the western USA. Matt Salzer and Malcolm Hughes

Poster: Seasonal Precipitation in the Mount Helan region, China reconstructed from tree-ring width for the last 224 years. Liu Yu, Cai Qiufang, An Zhisheng and M.K. Hughes

2005

Invited lecture, University of California, Berkeley, January 26.

Talk:The temporal texture of climate variability in western North America in recent millennia.

Contributed lecture, MTNCLIM workshop, Chico Hot Springs, MT, March 1-4.

Talk: Another possible explanation for the acceleration of tree-ring growth at high elevations in the interior west since the late 19th century

Invited lecture, special symposium to honor Robert E. Dickinson, Georgia Tech, Atlanta, GA, October 16-18.

Talk: A confounding problem in the mountains.

2006

Invited lecture. Workshop on "Climate change, the tree growth response and reconstruction of climate", Krasnoyarsk, Russia, January 25-29, 2006.

Talk: Special problems of high elevation trees in dendroclimatology.

Invited seminar, School of GeoSciences, Edinburgh University, UK, April 21, 2006.

Talk: Natural archives and unnatural climate?: a case history from ancient pines.

Invited presentation, NAS panel on "Surface temperature reconstructions for the last 2000 years", Washington, DC. March 3, 2006.

Invited keynote lecture, 7th International Conference on Dendrochronology, Beijing, PRC, June 2006.

Talk: Dendrochronology in climatology: Natural archives and unnatural climate?

Invited lecture, Tree-Rings, Kings, and Old World Archaeology and Environment: Cornell Dendrochronology-Archaeology Conference in Honor of Peter Ian Kuniholm. Ithaca, NY, November 3-5, 2006.

Talk: Distant fire: tree rings, ice cores and volcanoes.

OUTREACH FOR LAST 5 YEARS

Local/State Outreach

Many press and media interviews concerning my research.

Member of organizing committee for College of Science public lecture series on Evolution, Spring 2006.

Member of organizing committee for College of Science public lecture series on Global Climate, Fall 2006.

Lecture in Provost's Faculty Community lecture series, November 1, 2005, title "Natural archives and unnatural climate? Recent decades in the context of past millennia".

Lecture in College of Science Global Change lecture series, October 17, 2006, title "Global climate change: the evidence" – podcast available at: http://podcasting.arizona.edu/globalclimatechange.html

Invited talk to host program of Association of University Anesthiologists Meeting, Tucson, May 13, 2006, title "Nature's logbook – tree rings and our changing environment".

National/international outreach

Many press and media interviews concerning my research, for example for NPR, BBC, NHK Japan, local stations in Finland and Russia, New York Times, Time magazine, Weather Channel, USA Today, Wall Street Journal, etc.: most recently Lou Dobbs on CNN, July 2006.

Presented papers or given invited lectures in Argentina, the Netherlands, Germany, Finland, Switzerland, Argentina, Mexico, Peoples Republic of China, Japan, Russia, and India as well as in the U.S.A.

TEACHING IN LAST 5 YEARS

Courses taught

Semester	Course	Title (Units)	Participants
Presess02	GEOS497/597I	Practical dendroclimatology(3)	18
Fall 02	GEOS/ANTH/WSM464/564	Intro to dendro(4)	10
Presess03	GEOS497/597I	Practical dendroclimatology(3)	17
Fall 03	GEOS/ANTH/WSM464/564	Intro to dendro (4)	10
Spring 04	GEOS/WSM 595e	Dendro. Colloquium (1)	4
	BIOC 595F/597C	The Biology of Tree Rings	8

Presess04	GEOS597I	Practical dendroclimatology(3)	13
Fall 04	GEOS/ANTH/WSM564	Intro to dendro (4)	
8			
Spring 04	GEOS/WSM 595e	Dendro. Colloquium (1)	4
Fall 05	GEOS/ANTH/WSM464/564	Intro to dendro (4)	
9			
Presess06	GEOS597I	Practical dendroclimatology(3)	10
Fall 06	GEOS/ANTH/WSM464/564	Intro to dendro (4)	
10			

Summary of available student evaluations for past 5 years - mean response to "course overall" question (comparator group mean in parentheses where available).

Presession02 GEOS597I	4.64(na)
Presession03 GEOS597I	4.36(na)
Fall 02 GEOS464/564	4.55 (4.33)
Fall 03 GEOS464/564	4.3(4.3)
Spring 04 BIOC597c	4.2 (na)
Presession 04 GEOS597I	4.2 (na)
Fall 04 GEOS464/564	4.9(4.36)
Fall 2005 GEOS464/564	4.4(4.3)
Presession 06 GEOS597I	4.0 (na)

Advisees

	Dissertation Director	MS thesis Director	PhD Committee Member	MS Committee Member
2002	0	0	3	0
2003	0	0	3	0
2004	1	1	4	1
2005	1	1	4	1
2006	1	0	4	0

Postdoctoral fellows in the last 5 years

Drs. Fenbiao Ni, Mathew Salzer, Kurt Kipfmueller.

PUBLICATIONS[1]

In preparation

Kipfmueller, K. Hughes, M.K. and Meko, D.M. A comparison of regional curve standardization and a traditional standardization techniques for recovering low frequency climate information from simulated tree-ring data. In preparation.

Hughes, M.K. and Salzer, M.W. 20th century growth acceleration in high-elevation pines, unique in 5,000 years, may have climatic cause. In preparation.

Hughes, M.K. and Ni Fenbiao. Imprints of large-scale circulation indices on millennial tree-ring chronologies in the western United States. In preparation.

Hughes, M.K., Naurzbaev, M., Siderova, O., Nikolayev, A.and Vaganov, E.A.. A millennial temperature-sensitive tree-ring record from the Taimyr Peninsula, Siberia. In preparation.

[1] * indicates peer-reviewed

Hughes, M.K., Naurzbaev, M., Touchan, R., Siderova, O., and Vaganov, E.A.. A 2000-year temperature record from northeastern Eurasia from tree-ring data. In preparation.

Hughes, M.K., Ni Fenbiao, Mann, M.E. and Park, J. Global multidecadal to century-scale climate oscillations during the last 1000 years. In preparation.

Hughes, M.K., Swetnam, T.W. and Diaz, H.F. (editors) *Dendroclimatology: Progress and Prospects.* (In preparation for Springer Verlag).

In press

129. Graham, N., Hughes, M.K., Cobb, K., Graumlich, L.J., Kennett, D., Kennett J., and Stott L. Increasing Tropical Pacific SSTs at the transition into the Little Ice Age. *Climatic Change* (In press)*.
128. Malamud-Roam, F., Dettinger, M., Ingram, B.L., Hughes, M.K., Florsheim, J. Holocene climates and connections between the San Francisco Bay estuary and its watershed. *San Francisco Estuary and Watershed Science* (In press).
127. Salzer, M.W. and Hughes, M.K. Bristlecone Pine Tree Rings and Volcanic Eruptions over the Last 5000 Years. Quaternary Research. (in press)*.

2006

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9. Hughes, M. K. Ground vegetation net production in a Danish beech wood. *Oecologia,* 18,251-258 (1975)*

1974

8. Hughes, M. K. The Urban Ecosystem. *The Biologist*,21,117-127 (1974)

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7. Hughes, M. K. and F. A. Hibbert. *The ecological survey for the Central Lancashire New Town*. C.L.D.C., Preston. (1972)
6. Hughes, M. K. and B. A. Whitton. Algae of Slapestone Sike, Upper Teesdale. *Vasculum*,LVII,30-35 (1972)

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5. Hughes, M. K. Seasonal calorific values from a deciduous woodland in England. *Ecology*,52,923-926 (1971)*
4. Hughes, M. K. Ground vegetation biocontent and net production in a deciduous woodland. *Oecologia,7*,127-137 (1971)*
3. Hughes, M. K. Tree biocontent, net production and litter fall in a deciduous woodland. *Oikos,*22,62-73 (1971)*

1970

2. Hughes, M. K. Ground vegetation and forest litter production. *In Methods of study in soil ecology. Proceedings of the Paris Symposium*. Ed. Phillipson, John. pp145-150 IBP/UNESCO (1970)

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1. Hughes, M. K. and E. Lincoln. A simple integrator for use with solarimeters.*Oikos*,20,161-165 (1969)*

Table 1: M K Hughes Funded projects

Funding Agency	Title	Start Date	Lead PI	Amount $$ /Hughes % effort	Co-Pis

NSF	Arizona Center on Global Change: Planning Grant	7/1/88	Malcolm Hughes	35,000 /65%	Charles Hutchinson, William Sellers, Victor Baker
NSF	Long-term Spatial and Temporal Variability of Precipitation,Evaporation, Soil Moisture and Runoff as Related to Drought Occurrence over Continental United States	1/1/89	Charles Stockton	323,420 /5%	Malcolm Hughes
NSF	Solar Modulation of Atmospheric 14C production during the Little Ice Age and Medieval Warm Epoch (Solar Wind, Flares and Irradiance)	4/1/90	Paul Damon	158,378 /5%	Malcolm Hughes and others?
NOAA	Climatic Variations in the Asian Monsoon Region since AD 1600	10/1/90	Malcolm Hughes	220,017 /50%	Raymond Bradley, Lonnie Thompson
National Park Service: Global Change Program	Tree-ring evidence of climatic change and vegetation responses	6/1/91	Lisa Graumlich	427,457 /40%	Malcolm Hughes
NSF	Project ARRCC: Analysis of Recent and Rapid Climate Change	9/15/91	Malcolm Hughes	126,501 /100%	
NSF	Global Change: Cosmic Rays, Solar Activity, Geomagnetism, Cosmogenic Isotopes and Climate	6/15/93	Paul Damon	106,244 /5%	Charles Sonett,Austin Long, Douglas Donahue,Malcolm Hughes
NOAA	Climate in North-Central China since AD 1600 from Tree-Ring Variables	6/1/193	Malcolm Hughes	160,005 /50%	Steve Leavitt
NSF	A multimillennial temperature reconstruction from far northeastern Eurasia	4/1/94	Malcolm Hughes	49,894 /100%	
NOAA	Climate Variability in Western North America on decadal time scales	5/1/95	Malcolm Hughes	50,000 /50%	David Meko
NSF	Preparation for collaborative work on past climate in Jordan	10/1/95	Malcolm Hughes	9,000 /30%	Ramzi Touchan

NOAA	Late Holocene climate variability from long tree-ring chronologies	6/1/96	Malcolm Hughes	127,187 /100%	
NSF	Development of Computer Assisted Tree Ring Dating System	9/15/96	Malcolm Hughes	260,048 50%	Robert Schowen-gerdt
CRDF	Natural variability of summer temperature in the Siberian subarctic recorded in tree rings	?/?/97	Malcolm Hughes	18,000 /50%	Eugene Vaganov
NSF	A Multimillennial Temperature Reconstruction from Far Northeastern Eurasia	8/1/97	Malcolm Hughes	266,027 /100%	
NOAA	Climate variability, social vulnerability and public policy in the southwestern US: a proposal for regional assessment activities	?/?/97	Roger Bales	?/ 10%	T. Finan, M.Hughes, D. Liverman, S.Sorooshian
USDA Forest Service	A tree-ring reconstruction of Pandora Moth population history in central and southern Oregon: expansion of exploratory study	1/1/97	Tom Swetnam	26,171 /5%	Malcolm Hughes
NOAA	Decade-to-century hydroclimatic variability in Western North America	8/1/98	David Meko	39,986 /30%	Malcolm Hughes
NSF	Temperature variability since AD 1000 in the Western US from tree-ring	8/1/98	Malcolm Hughes	278,621 /50%	Connie Woodhouse, Peter Brown
NSF	Climate and society on the Colorado Plateau, AD 500-1600	5/1/199	Malcolm Hughes	33,300 /90%	Jeff Dean
UMASS (sub-NSF)	Multiproxy climate reconstruction: Extension in space and time, model/data intercomparison	9/1/99	Malcolm Hughes	17,958 /100%	
NSF	International Conference on Dendrochronology 2-7 April 2000, Mendoza, Argentina	12/1/99	Malcolm Hughes	36,864 /100%	
UNR (sub-NOAA)	Tree-ring construction of Climate Variability at the Tropical boundary of the American West	6/1/00	Malcolm Hughes	14,446	Wolfgang Berger, Franco Biondi, Daniel Cayan
CRDF	Tree-ring measurements and NDVI as indicators of forest growth in Siberia as influenced by varying climate (Russia)	7/1/00	Malcolm Hughes	55,010 /50%	Eugene Vaganov

NSF	Near East climate variability from tree-ring, Syria, Turkey, Jordan	7/1/00	Ramzi Touchan	222,604 /20%	Malcolm Hughes

NSF	The application of tree-ring analysis to reconstruct the drought/hydro-climatic history of the West African Sahel	5/7/99	Malcolm Hughes	47,588 /50%	
NOAA	Global multidecadal to century-scale climate oscillations during the last 1000 years	5/1/01	Malcolm Hughes	195,326 /100%	
NOAA	Variability, social vulnerability, and public policy in the Southwestern United States: a propsal for regional assessment activities	6/1/01	Roger Bales	3,354,465 /5%	Barbara Morehouse, Soroosh Sorooshian, Andrew Comrie, Diana Liverman, Malcolm Hughes, Timothy Finan, Maria Carmen Lemos
NSF	Development of an enhanced computer-assisted analysis system for eath science investigation of laminated sediments and tree rings	1/1/02	Jonathan Overpeck	436,480 /15%	Malcolm Hughes, Robert Schowen-gerdt
NSF	Natural spatiotemporal variability of climate over the Western US in the late Holocene	7/1/02	Malcolm Hughes	412,541 /100%	
NOAA	Collaborative: Reconstruction and analysis of patterns of climate variability over one to two millenia	9/1/02	Malcolm Hughes	111,319 /100%	
NSF	Acquisition of an Analytical Facility for High-Resolution Paleoclimatology	8/1/03	Michael Evans	339,915 /10	J. Warren Beck, J.T.Overpeck, J.E.Cole, Malcolm Hughes
NSF	New and improved tree-ring records of climate from Siberia	6/1/03	Malcolm Hughes	37,248	

				/100%	
NOAA	Time-dependent bias in tree-ring based reconstruction	9/1/03	Malcolm Hughes	147,423 /80%	Dave Meko
NSF	Meeting on tree-ring and climate: sharpening the focus	10/8/03	Malcolm Hughes	15,054 /100%	
NOAA	Meeting on tree-ring and climate: sharpening the focus	1/1/04	Malcolm Hughes	15,054 /100%	
Institute for Aegean Prehistory	Volcanic eruptions 3400-3700 years ago recorded in *Pinus longaeva* tree-rings: expanded collections and analyses	6/1/05	Malcolm Hughes	8,972 /100%	
NOAA	Developing and using realistic synthetic tree-ring data to constrain climate models.	6/1/06	Malcolm Hughes	186,575 /50%	Michael Evans
NSF	Collaborative research: A geospatial approach to dendroclimatology of multi-millennial bristlecone pine	4/1/06	Malcolm Hughes	396,198 /100%	

CURRICULUM VITA
of
Steven W. Leavitt
December 2006

TITLE- Professor of Dendrochronology, Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ 85721
(Phone 602-621-6468; FAX 602-621-8229)

EDUCATION-

May 1982 Ph.D. Geosciences. University of Arizona, Tucson
(Dissertation title: Inference of past atmospheric $\delta^{13}C$ and P_{CO2} from $^{13}C/^{12}C$ measurements in tree rings)

Aug 1977 M.S. Environmental Sciences. University of Virginia, Charlottesville
(Thesis title: Soil-plant relationships of nutrient and non-nutrient

	metals in Louisa Co., Virginia)
June 1971	B.S. Geology. University of Illinois, Urbana (Thesis title: The geology and genesis of magmatic iron deposits at Kiruna and Gellivare, Sweden, and Iron Mountain, Missouri)

PROFESSIONAL BACKGROUND-

Jul 1996 to present	Professor, University of Arizona
Jul 1992 to Jul 1993	Acting Director, Laboratory of Tree-Ring Research
Aug 1990 to Jun 1996	Associate Professor of Dendrochronology, University of Arizona
Jul 1989 to Aug 1990	Associate Professor of Geology, University of Wisconsin-Parkside
Aug 1984 to Jul 1989	Assistant Professor of Geology, University of Wisconsin-Parkside
Jun 1982 to Jul 1984	Post-doc Research Associate, University of Arizona, Dept. of Geosciences

TEACHING EXPERIENCE-

Graduate teaching assistant - Environmental Geology, Physical Geology, Mineralogy, Optical Mineralogy, Geology Summer Field Camp.

As Professor - The Weather, Earth & Man, Environmental Earth Science, Geochemistry, Environmental Geology, Hydrogeology, Dendrochronology, Senior Seminar, Mineralogy, Petrology, Introduction to Global Change, Tree Rings as Chronometers, Dendrochronology: Biological Applications, Global Biogeochemical Cycles, Introduction to Global Change (Nats101)

RESEARCH INTERESTS-

Light stable-isotope geochemistry applied to geological and environmental problems; the global carbon cycle in geologic time and the recent imbalance from anthropogenic effects; environmental and climate reconstructions; dendrochronology; carbon storage in soils under high CO_2 conditions.

PROFESSIONAL SOCIETIES- The Geochemical Society, American Geophysical Union, The Tree-Ring Society, American Quaternary Association, Ecological Society of America

PUBLICATIONS

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Holle, R.R., Simpson, J. and **Leavitt, S.W.**, 1979. GATE B-scale cloudiness from whole-sky cameras on four U.S. ships. Monthly Weather Rev. **107:**874-895.

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1986

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Leavitt, S.W. and Long, A., 1986. Stable-carbon isotope variability in tree foliage and wood. Ecology **67:**1002-1010.

1987

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1997

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1998

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Leavitt, S.W., 1998. Review of *Biogeochemistry, An Analysis of Global Change* by W.H. Schlesinger, EOS (Trans. Amer. Geophys. Union) **79(2)**: 20.

1999

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Pendall, E. and Leavitt, S.W., 1997. El Niño's winter precipitation recorded in cellulose D/H. 82nd Annual Meeting of the Ecological Society of America, 10-14 August. Albuquerque.

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Leavitt, S.W., Drake, B.G., Matamala, R. and Hungate, B., 1997. Stable-carbon isotope tracing of carbon input to soils of wetland communities under CO_2 enrichment. 82nd Annual Meeting of the Ecological Society of America, 10-14 August. Albuquerque.

Pedicino, L.C., Betancourt, J.L., Leavitt, S.W., Van de Water, P.K., 1997. Leaf $\delta^{13}C$ responses of seven southwestern plant species to climate and CO_2 enrichment during the last 100 years. 82nd Annual Meeting of the Ecological Society of America, 10-14 August.

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Van de Water, P.K., Leavitt, S.W. and Betancourt, J.B., 1997. Inter- and intra-plant variability of carbon isotopes and the packrat midden record. 82nd Annual Meeting of the Ecological Society of America, 10-14 August. Albuquerque.

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Leavitt, S.W., Wright, W.E. and Long, A., 1998. Evidence for ENSO in tree-ring $\delta^{13}C$ along a 500-km transect in southern Arizona and New Mexico. 15th Pacific Climate Workshop, Santa Catalina Island, CA, 27-29 April.

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Brooks, T.J., Wall, G.W., Pinter, P.J. Jr., Kimball, B.A., Triggs, J.M., Adam, N.A., **Leavitt, S.W.**, LaMorte, 1999. Effects of free-air CO2 enrichment on sorghum canopy photosynthesis and architecture. Western Photosynthesis Conference, Asilomar Conference Center, Pacific Grove, CA, 7-10 Jan.

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***Leavitt, S.W.**, 2002. Moisture availability and water-use efficiency in $\delta^{13}C$ of pine tree rings of the U.S. Southwest. 6th International Conference on Dendrochronology, Quebec City, Canada, 22-27 August.

***Leavitt, S.W.**, Wright,W.E., Hemming, D., Long, A., 2002. Micro-variation of $\delta^{13}C$ in tree rings of ponderosa pine from S. Arizona. Ecological Society of America Annual Meeting, 4-9 August, Tucson.

Wright,W.E., **Leavitt, S.W.**, 2002. $\delta^{18}O$ Variation in *Pinus ponderosa* needle subdivisions from two growing seasons. Ecological Society of America Annual Meeting, 4-9 August, Tucson.

Wright,W.E., **Leavitt, S.W.**, 2002. Specific humidity reconstruction in the semi-arid southwestern United States using cellulose oxygen isotope ratios. 6th International Conference on Dendrochronology, Quebec City, Canada, 22-27 August.

Morris, S.J., **Leavitt, S.W.**, Gregorich, E.G., and Paul, E.A., 2002. Role of resistant fractions in soil C sequestration. Ecological Society of America Annual Meeting, 4-9 August, Tucson.

Panyushkina, I.P., **Leavitt, S.W.** and Noggle, S., 2002. A tree-ring study of wood of possible Younger Dryas age from central Illinois. 6th International Conference on Dendrochronology, Quebec City, Canada, 22-27 August.

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Robertson, I., Loader, N.J., McCarroll, D., Carter, A.H.C., Cheng, L. and **Leavitt, S.W.**, 2002. $\delta^{13}C$ of tree-ring lignin as an indirect measure of climate change. BIOGEOMON 4th Int. Symp. on Ecosystem Behavior, University of Reading, UK, 17-22 August.

Ballantyne, A.P., Baker, P.A., Jackson, R., Silman, M., Evans, M. and **Leavitt, S.W.**, 2002. Oxygen isotopes and ring widths in the tropical tree species *Polylepis tarapacana* as proxies of past precipitation in the tropical Andes of South America. American Geophysical Union Annual Meeting, San Francisco, CA, 9-13 December, *Eos Trans. AGU, 83*(47), Fall Meet. Suppl., Abstract PP51B-11.

Follett, R.F., Kimble, J.M., **Leavitt, S.W.** and Preussner, E.G., 2002. The potential use of soil-C isotope analyses to evaluate paleoclimate. American Geophysical Union Annual Meeting, San Francisco, CA, 9-13 December, *Eos Trans. AGU, 83*(47), Fall Meet. Suppl., Abstract B52A-0731.

Kimball, B.A., Triggs, J.M., Pinter, P.J. Jr., Wall, G.W., Ottman, M.J., **Leavitt, S.W**., Matthias, A.D. and Brooks, T.J., 2002. Free-air CO_2 enrichment of sorghum: Energy balance and evapotranspiration. ASA-CSSA-SSSA Annual Meeting, Indianapolis, Indiana, 10-14 November.

2003

Cheng, L., Martens, D., **Leavitt, S.W.**, Kimball, B.A., Matthias, A.D., Ottman, M.J., Williams,

D.G., Wall, G.W. and Pinter, P.J., Jr., 2003. Free Air-CO_2 Enrichment (FACE) of C4-Sorghum: Biochemical Composition and Decomposition of Sorghum Tissues Grown Under Elevated CO_2. ASA-CSSA-SSSA Annual Meeting, Denver, Colorado, 2-6 November.

Follett, R. F., **Leavitt, S. W.**, Kimble, J. M., and Pruessner, Elizabeth G., 2003. Paleoenvironmental inferences from $\delta^{13}C$ of soil organic carbon in ^{14}C-dated profiles in the U.S. Great Plains. XVI INQUA Congress, Reno, NV, 23-30 July.

Panyushkina, I.P. and **Leavitt, S.W.**, 2003. Tree-ring investigation of the Younger Dryas in the U.S. upper Midwest. XVI INQUA Congress, Reno, NV, 23-30 July.

Pinter, P.J. Jr., Kimball, B. A., LaMorte, R. L., Rokey, R. R., Maneely, S. M., Wall, G. W., **Leavitt, S. W.**, Ottman, M. J., 2003. Will rising levels of atmospheric CO_2 affect NDVI predictions of APAR? ASA-CSSA-SSSA Annual Meeting, Denver, Colorado, 2-6 November.

Leavitt, S. and Panyushkina, I., 2003. Tree-ring records of near-Younger Dryas time in the U.S. Upper Midwest. 18th International Radiocarbon Conference, Wellington, New Zealand, 1-5 September 2003.

Leavitt, S., Follett, R., Kimble, J. and Pruessner, E., 2003. Paleoenvironmental inferences from $\delta^{13}C$ of soil organic carbon in ^{14}C-dated profiles in the U.S. Great Plains. 18th International Radiocarbon Conference, Wellington, New Zealand, 1-5 September 2003.

Leavitt, S.W., 2003. Stable-carbon isotope inferences from the Maricopa FACE Experiments. ASA-CSSA-SSSA Annual Meeting, Denver, Colorado, 2-6 November.

Li, Z.-H., **Leavitt, S.W.**, Mora, C. I. and Liu, R.-M., 2003. Evidence that earlywood-latewood size and isotope differences can influence long-term tree-ring $\delta^{13}C$ trends. Geological Society of America Annual Meeting, Seattle, WA, 2-5 November.

2004

*__Leavitt, S.W.__, "Tracing a $\delta^{13}C$ Pulse from Canopy to Growth Rings of a Ponderosa Pine Tree near Tucson, Arizona", Mini-Workshop on Pine Trees, Weizmann Institute, Israel, 14March.

Benz, B.F., **Leavitt, S.W.**, Eastoe, C., and Cheng, L., 2004. Prehistoric Maize Evolution in Mexico. Society for American Archaeology 69th Annual Meeting, Montreal, Québec, 31 March-4 April 2004.

__Leavitt, S.W.__, 2004. Tree-Ring Isotope Rhythms: Climate and Dating from the Bands. AAAS Pacific Division, 85th Annual Meeting, Utah State University, Logan, 13–17 June 2004, Symposium on
"Lords of the Rings: Dendrochronology Yesterday, Today, and Tomorrow".

Panyushkina, I.P. and __Leavitt, S.W.__, 2004. High-resolution records of the Pleistocene-Holocene transition from tree rings in central North America. American Quaternary Association Biennial Meeting, Lawrence, Kansas, 26-28 June 2004.

__Leavitt, S.W.__, 2004. Stable-carbon isotopes in tree rings and the prospect that trees are increasing water-use efficiency world-wide. Tree Rings and Climate: Sharpening the Focus, Tucson, Arizona, 6–9 April 2004

Van de Water, P. K., Betancourt, J.L., and **Leavitt, S.W.**, 2004. Distribution patterns and carbon acquisition physiology of the C4 shrubs Atriplex spp. in the southwestern USA across the last glacial-interglacial cycle. Geological Society of America Ann. Meeting, Denver, CO, 2-7 November 2004.

__Leavitt, S.W.__, Panyushkina, I.P., and Lange, T.E., 2004. Late Pleistocene-Early Holocene forests from the Great Lakes Region, USA: Preliminary radiocarbon and stable-isotope results. Geological Society of America Ann. Meeting, Denver, CO, 2-7 November 2004.

Cheng, L., **Leavitt, S.W.**, Kimball, B.A., Pinter Jr., P.J., Ottman, M.J., Matthias, A.D., Wall,

G.W., Brooks, T. J., Williams, D.G., Thompson, T.L., 2004. Dynamics of labile and recalcitrant soil carbon pools in a sorghum Free-Air CO_2 Enrichment (FACE) agroecosystem. EOS Trans. AGU, **85(47)**, Fall Meeting Supplement, Abstract B13C-0242.

2005

Williams, P., Still, C., Fischer, D., **Leavitt, S**., 2005. Fog and Vegetation on the California Channel Islands: A Tree Ring and Satellite Analysis, AGU Fall Meeting (5-9 Dec.), Eos Trans. *AGU, 86*(52), Fall Meet. Suppl., Abstract B11A-1009.

Leavitt, S.W., 2005. Regional Expression of the 1988 U.S. Midwest Drought in Seasonal Stable-Carbon Isotope Patterns of Tree Rings, Eos Trans. *AGU,* AGU Fall Meeting (5-9 Dec.), *86*(52), Fall Meet. Suppl., Abstract H33B-1385

Panyushkina, I.P., **Leavitt, S.W.**, Lange, T., Schneider, A.F., 2005, Tree-Ring Investigation of an in situ Younger Dryas-Age Spruce Forest in the Great Lakes Region of N. America, AGU Fall Meeting (5-9 Dec.), Eos Trans. *AGU, 86*(52), Fall Meet. Suppl., Abstract PP13A-1484.

Harold C. Fritts, Alex V. Shashkin, Debbie L. Hemming, **Steven W. Leavitt**1,William Edward Wright, Geoff Downes, 2005 "Advances in process-based modelling of the softwood cambium" IUFRO**,** "Connection between Forest Resources and Wood Quality : Modelling Approaches and Simulation software", Waiheke Island Resort, New Zealand, November 20-27, 2005.

2006

Panyushkina, I.P. and Leavitt, S.W., 2006. Late Glacial-Early Holocene Climate Variability in the Great Lakes Region from Tree Rings. AMQUA Biennial Meeting, Bozeman, Montana, August 2006.

Leavitt, S.W., 2006. Recent Advances and Progress in Stable Isotope Dendrochronology. 7th International Conference on Dendrochronology, Beijing, China, 11-17 June 2006.

Leavitt, S.W., Isotopic Pooling vs. Separate Analysis with Averaging: The Fallacy of a Significant Difference. 7th International Conference on Dendrochronology, Beijing, China, 11-17 June 2006.

Tardif, J.C., Conciatori, F. and Leavitt, S.W. 2006. Ring width, $\delta^{13}C$ and climate in *Picea glauca* growing near Churchill, subarctic Manitoba and north central Canada. 7th International Conference on Dendrochronology, Beijing, China, 11-17 June 2006.

Wright, W.E. and Leavitt, 2006. Boundary layer humidity reconstructed from $\delta^{18}O$ in summer wood of *Pinus arizonica* from the United States Southwest. 7th International Conference on Dendrochronology, Beijing, China, 11-17 June 2006.

Leavitt, S.W., Panyushkina, I.P. and Lange, T. 2006. Radiocarbon "Wiggles" in Great Lakes Wood ca.10,000 to 12,000 BP. 19th International Radiocarbon Conference, 3-7 April 2006

Leavitt, S.W., 2006. Tree Rings and Water. EPRECOT (Effects of Precipitation Change On Terrestrial ecosystems) Workshop, Elsinore, Denmark, 22-25 May 2006.

CURRICULUM VITAE

DAVID M. MEKO

EDUCATION

Pennsylvania State University, B. S., 1972, Meteorology
University of Arizona, M. S., 1974, Atmospheric Sciences
University of Arizona, Ph.D., 1981, Hydrology and Water Resources

EMPLOYMENT (since 1986)

2004-Present: Associate Research Professor, Laboratory of Tree-Ring Research (LTRR)
1994-2004: Principal Research Specialist, Laboratory of Tree-Ring Research
1991-1994: Adjunct Assistant Professor of Dendrochronology, Laboratory of Tree Ring Research
1988-1991: Research Associate, Laboratory of Tree-Ring Research, University of Arizona.
1986-1988: Hydrologist/Assistant Director, Water Resources Department, Tohono O'odham Nation, Sells, Aizona

PROFESSIONAL MEMBERSHIPS

Member of American Meteorological Society
Member of American Geophysical Union
Science Forum Panel for Gila River

GRANTS AND CONTRACTS (since 2001)

2001 "BC Hydro/University of Arizona dendrochronology study -- Peace Athabasca Delta." **PI: D. Meko**. BC Hydro (through law firm Proudfoot, Lawson Lundell Lawson & McIntosh) 1 year, $58,215.

2003 "Time-depedendent bias in tree-ring based reconstructions." PI: M.K. Hughes; **Co-PI: D.M. Meko**. NOAA CCDD Program, 2 years, $149,879.

2003 "Extreme droughts in the Winnipeg River Basin, Canada." **PI: D. Meko**; Co-PI: Scott St. George. Manitoba Hydro. 4 years. $69,918.

2003 "A tree-ring based hydroclimatic assessment of synchronous extreme streamflow episodes in the upper Colorado and Salt-Verde River basins". PI: Katie Hirschboeck, **Co-PI: David Meko**. Salt River Project, 1-yr, $85,516.

2004 "Hydroclimatic reconstruction and ancient blue oak mapping over the drainage basin of San Francisco Bay." **PI: D. Meko**. CALFED-- subcontracted through University of Arkansas, 3 years, $116,201.

2004 "Enhancing water supply reliability through improved predictive capacity and response." PIs: K. Jacobs; B. Colby; **D. Meko**; B. Nijssen. Technology and Research Initiative Fund (TRIF), Water Research, Outreach and Education, Water Sustainability Program, 2 years, $132,208 ($18,431 Meko).

2005 Drought on the Colorado River: Tree-ring Perspective, A.D. 1200s to Present. PI: **D. Meko**. California Department of Water Resources, 12 months, 1 year, $64,000.

2005 The Current Drought in Context." A Tree-Ring Based Evaluation of Water Supply Variability for the Salt-Verde River Basin. PIs: Hirschboeck K. K. and **Meko D. M**. The Salt River Project. Duration: August 2005-July 2007. Funding level: $183,000.

2006 Integrating Improved Water Supply Predictive Capacity and Response into Lower

Colorado Basin Policy and Management. PIs: B. Colby, K. Jacobs, **D. Meko**, P. Troch. US Bureau of Reclamation, 2 years, $232,327.

TEACHING

"Applied Time Series Analysis", GEOS 585A. Regular 3-credit course, offered every other Spring Semester. Also offered online (http://tree.ltrr.arizona.edu/~dmeko/geos585a.html).

"Water Resources and Dendrochronology", a short course offered at Hashemite University, Jordan. Preparation included approximately one week for a manual and organization of lecture material. Organized and presented with Dr. Ramzi Touchan. Course dates: 7/9/2004-7/15/2004

Guest Lectures.

- Introductory Dendrochronology (GEOS 464/564), typically 2 lectures per year
- Practical Dendroclimatology (GEOS 497I/597I) , typically 1 lecture per year
- Surface Moisture in Arid Lands: Mechanisms, Models, and Mediations (GEOG 696c, Instructor Steve Yool), 1 lecture in Fall Semester 2006

SERVICE

- Reviews research proposals for the NOAA Global Change Program and the Earth System History section of NSF
- Reviews manuscripts for several scientific journals: *The Holocene*, the *Canadian Journal of Forest Research*, the Journal *of the American Water Resources Association*, and the *Journal of Climate*.
- Serves on a six-member science forum committee overseeing scientific work associated with the Gila River and New Mexico's benefit from the 2004 Arizona Water Settlement Act.
- Serves as a member of the Global Change Minor Committee.
- Gives presentations to water management groups on the importance of considering climate variability and climate change in resource planning. Gives newspaper and television interviews, and in 2005-06 was interviewed on water supply issues by a number of papers, including the Arizona Daily Star, Arizona Republic, Los Angeles Times, New York Times, and the Albuquerque Journal. He has appeared twice since 2004 as a guest on the local PBS program "Arizona Illustrated"
- Advises students on issues of time series analysis and compute programming
- Delveloped and supports a set of Matlab computer programs for dendroclimatology applications

PUBLICATIONS

Edited Books

Dean J. S., Meko D. M. and Swetnam T. W., editors (1996), p. 889 pp. Tree Rings, Environment and Humanity, Proceedings of the International Conference, 17-21 May, 1994. Radiocarbon, Tucson, Arizona, USA.

Book Chapters (refereed)

Meko D. M. (1992a) Dendroclimatic evidence from the Great Plains of the United States. In

Climate since A.D. 1500 (ed R. S. Bradley and P. D. Jones), pp. 312-330. Routledge, London.

Meko D. M. (1992b) Spectral properties of tree-ring data in the United States Southwest as related to El Nino/Southern Oscillation. In *El Nino, Historical and Paleoclimatic Aspects of the Southern Oscillation* (ed H. F. Diaz and V. Markgraf), pp. 227-241. Cambridge: Cambridge University Press.

Meko D. M. (2005) Changes in regional hydroclimatology and water resources on seasonal to interannual and decade-to-century timescales. In *Encyclopedia of Hydrological Sciences, Volume 5, Part 17, Climate Change* (ed M. G. Anderson), pp. 3073-3088. John Wiley & Sons, Ltd.

Meko D. M. and Woodhouse C. A. (in review) Dendroclimatology, dendrohydrology, and water resources management. In *Dendroclimatology: progress and prospects* (ed M. K. Hughes, T. W. Swetnam and H. F. Diaz). Springer.

Stockton C. W., Boggess W. R. and Meko D. M. (1985) Climate and tree rings. In *Paleoclimate analysis and modeling* (ed A. D. Hecht), pp. 71-150. John Wiley & Sons.

Journal Articles And Other Refereed Publications

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Meko D. M. (in press) Tree-ring inferences on water-level fluctuations of Lake Athabasca. *Canadian Water Resources Journal* **31**(4).

Meko D. M. and Baisan C. H. (2001) Pilot study of latewood-width of confers as an indicator of variability of summer rainfall in the north American Monsoon region. *International J. of Climatology* **21**, 697-708.

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Articles in Popular Magazines

Woodhouse C. A. and Meko D. M. (2002) Introduction to tree-ring-based streamflow reconstructions. *Southwest Hydrology* **1**(2), 14-15.

Public Talks

Meko D. M. Streamflow records extended with tree rings. Bus-tour presentation to Lower Colorado River Tour, April 6, 2006; sponsored by the Water Education Foundation.

Conference Procceedings, Abstracts, Oral Presentations

Graham N. E., Hughes M. K., Meko D. M., Rodbell D. F. and Thompson L. G. (2002) Tropical modulation of low frequency precipitation variability in the western U.S. during the past 1200 years. *EOS* **83**(47), F897.
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Hirschboeck K. K., Meko D. M., Morino K., Welti J. and Czyzowska E. (2004b) Using tree-rings to determine the longterm record of synchronous extreme streamflow episodes in the Salt-Verde and Upper Colorado River Basins. Poster presentation at the Arizona Hydrological Society Annual Symposium, Tucson, AZ, 16-17 September, 2004.
Hirschboeck K. K., Meko D. M., Morino K., Welti J. and Czyzowska E. (2005) Collaboration between water managers and tree-ring researchers to evaluate long-term extreme streamflow episodes in the Salt-Verde and Upper Colorado River Basins. Association of American Geographers Annual Meeting. Denver, CO, 5/4.
Hirschboeck K. K., Meko D. M., Ni F., Hallman C., Czyzowska E., Harlan T. and Maddox R. (2004a) Rawindsonde observations as tools for exploring mountain-climate linkages at mid- and high-elevation tree-ring sites. Poster presentation at the Mountain Climate Sciences Symposium, Anticipating Challenges to Western Mountain Ecosystems and Resources, Kings Beach, Lake Tahoe, California, 25-27 May 2004.
Jacobs K., Meko D., Nijssen B. and Colby B. (2005) Enhancing water supply reliability through improved predictive capacity and response. In *Drought Analysis, Prediction, and Impact Mitigation*. AGU 2005 Fall Meeting. San Francisco, 7/12.
MacDonald G. M. and Meko D. M. (2003) Long-term variability in river flow and associated lake levels in the Canadian prairie provinces: applied dendrohydrology. In *Reconstructing hydroclimatic variability in North America: progress, methods, and uncertainties II* (ed R. Webb and C. Woodhouse). AGU 2003 Fall Meeting. San Francisco, 12 December.
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Invited speaker at workshop. Quaternary Research Center and Joint Institute for the Study of the Atmosphere and Ocean, Seattle, WA, 4/5.

Meko D. (1999a) Paleoclimate of the Colorado Plateau and neighboring regions since A.D. 500. Discussant to paper presented by Malcolm Hughes. Climate and Society on the Colorado Plateau, A.D. 500-1600. Santa Fe Institute, Santa Fe, NM, 10/5.

Meko D. (1999b) Tree-ring reconstruction of precipitation. Discussant at Workshop. Assessing the full range of central North America droughts and associated landcover change. NOAA/NASA, Boulder, CO, 2/6.

Meko D., Baisan C., Stahle D. and Cleaveland M. (2001) Latewood-width variations and spatial pattern of monsoon precipitation. Invited oral presentation. Eighteenth Annual PACLIM Workshop. CALFED, USGS, NOAA, California Dept. of Water Resources, Pacific Grove, CA, 18/3.

Meko D. M. Enhancing water supply reliability: an interdisciplinary research project to enhance predictive capacity on the Colorado River: update on tree-ring component. Presentation to Colorado River Hydrology Work Group, U.S. Bureau of Reclamation, CADSWES, Boulder, CO, May 2, 2006.

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Meko D. M. (1989) Spatial patterns in severe sustained drought in the U.S. Southwest, 1600-1964, as inferred from tree rings. Oral presentation at 1989 Fall Meeting of the American Geophysical Union; abstract published in Eos, October 24, 1989.

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Meko D. M. (1994b) Southern California rainfall as reflected in regional tree-ring series from the southwestern USA. EOS, Transactions, American Geophysical Union, 1994 Fall Meeting, November 1, 1994/Supplement, Vol. 75, No. 44, p. 371.

Meko D. M. (1996a) Estimating the extremes of severe sustained drought for river basin management. Abstracts of papers presented the 1996 Fall Meeting, 15-19 December 1996. *Eos, Transactions, AGU (Supplement)* **77**(46), F127.

Meko D. M. (1996b) Statistical challenges to tree-ring reconstruction of climatic time series. Preprint volume of the 13th Conference on Probability and Statistics in the Atmospheric Sciences, 21-23 February, 1996, San Franciso, CA, pp. 22-25. American Meteorological Society.

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Meko D. M. (1998) Regional monthly climatic time series from station records with variable time coverage, pp. 50-54. preprint volume of the 14th Conference on Probability and Statistics in the Atmospheric Sciences, 11-16 January 1998, Phoenix Arizona. American Meteorological Society.

Meko D. M. (2000a) Invited discussant to session titled "Paleoclimate: tree rings, tree lines, geomorphology." Workshop on Paleoclimate and People. USGS, Taos, NMt, 8/6.

Meko D. M. (2000b) Long-term climate history. Invited oral presentation. Summer meeting. Arizona Association of Conservation Districts, Pinedale, AZ, 4/8.

Meko D. M. (2001b) Reconstructed Sacramento River System runoff from tree rings. Invited oral presentation. Meeting of the Reclamation Board. The Resources Agency, State of California, Sacramento, CA, 14/6.

Meko D. M. (2001c) The tree-ring record of severe sustained drought in the Southwest. Invited oral presentation. Meeting of the Program Committee. Tucson Regional Water Council, Tucson, AZ, 24/1.

Meko D. M. (2001d) Western juniper tree-ring data as PDO resource. Oral presentation describing potential of recently collected tree-ring data for PDO reconstruction. Workshop on Grand Unified PDO Reconstruction. NOAA, Seattle, WA, 9/11.

Meko D. M. (2003a) Augmenting seasonal precipitation records with partial-width measurements of tree rings. Managing Water Resources Under Conditions of High Climatic Variability in the U.S.-Mexico Border Region. La Paz, BCS, Mexico, 14 January.

Meko D. M. (2003c) Quantifying drought in the Sierra Nevada with tree rings: a frequency-dependent approach. In *Reconstructing hydroclimatic variability in North America: progress, methods, and uncertainties I*. Invited paper (ed C. Woodhouse and R. Webb). AGU 2003 Fall Meeting. San Francisco, 12 December.

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Meko D. M. (2005b) Tree-Ring Perspective on Hydrologic Drought in Sacramento and San Joaquin River Basins. Presentation at: American River Watershed Conference, Sacramento, California, 12-23 April, 2005.

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Meko D. M. (2005d) Tree-ring record of drought on Peace-Athabasca Delta. In *Drought in Western Canada*. Canadian Quaternary Association 2005 Annual Meeting. Winnipeg, Manitoba, 5-8 June.

Meko D. M. (2006b) Natural flow at Lees Ferry, a tree-ring perspective. NRC Committee on the Scientific Bases of Colorado River Water Management, Tucson, 15 February 2006.

Meko D. M. (2006c) Tree-Ring Applications to Drought Analysis in the monsoon region. Presentation at Monsoon Region Climate Applications, a Binational Workshop, May 8-11, 2006, Instituto Tecnológico de Sonora (ITSON), Guaymas, Sonora, Mexico.

Meko D. M. and Baisan C. H. (1999) Tree-ring indicators or long-term variability of the North American Monsoon. Proceedings of the 24th Annual Climate Diagnostics and Prediction Workshop, Tucson, Arizona, November 1-5, 1999.

Meko D. M. and Baisan C. H. (nd) Latewood-width index as an indicator of variability of the North American Monsoon. Paper presented at The International Conference on Dendrochronology for the Third Millennium, April 2-7, 2000, Mendoza, Argentina.

Meko D. M., Baisan C. H. and Hughes M. K. (1999) Climatic inferences from a 1200-year reconstruction of Sacramento River flow. Technical Report 64 of the Interagency Ecology Program for the Sacramento-San Joaquin Estuary: Proceedings of the Fifteenth Annual Pacific Climate (PACLIM) Workshop, Edited by Raymond Wilson and Lauren Buffaloe. Workshop held April 37-30, 1998, at The Wrigley Institute for Environmental Studies (EIEW), Two Harbors, Santa Catalina Island, California. Copy of report available from State of California, Department of Water Resources, P.O. Box 942836, Sacramento, CA 94236-0001, p. 122.

Meko D. M., Baisan C. H. and Morino K. A. (2003b) Extracting seasonal precipitation signal from tree-ring width. 2003 PACLIM Meeting, Pacific Grove, California, April, 2003.

Meko D. M., Baisan C. H. and Touchan R. (2001a) Low-frequency variations in juniper tree-ring indices. Poster presentation. Eighteenth Annual PACLIM Workshop. CALFED, USGS, NOAA, California Dept. of Water Resources, Pacific Grove, CA, 18/3.

Meko D. M., Caprio A., Hughes M. K. and Touchan R. (2002b) Tree-ring evidence for persistent shift in storm track over the western United States during epic drought near A.D. 1300. AMQUA 17th Biennial Meeting. Anchorage, Alaska, 9-11 August.

Meko D. M. and Caprio A. C. (2005) Tree-Ring inferences on spatial coherence of precipitation in the southwestern USA on the millennial time scale (ed L. Benson). 2005 Geological Society of America Annual Meeting, 16-19 October. Salt Lake City, UT.

Meko D. M., Caprio A. C., Touchan R. and Hughes M. H. (2002a) San Joaquin River flow reconstructed from tree rings. Poster presentation. Nineteenth Annual PACLIM Workshop. CALFED, USGS, NOAA, California Dept. of Water Resources, Pacific Grove, CA, 3/3.

Meko D. M., Caprio A., Hughes M. K. and Touchan R. (2004a) Species dependence of dendrohydrologic drought signal in San Joaquin Basin. In *3rd Biennial CALFED Bay-Delta Program Science Conference*. Abstracts, p. 151. Sacramento, California, 4-6 October.

Meko D. M. and Hirschboeck K. K. (2005) From Schulman to stakeholders: An overview of dendrohydrology in the Southwest. In *Anasazi, Drought, Volcanoes, and Forest Fires: A Century of Dendrochronology in the Southwest*. The American Association for the the Advancement of Science, Southwestern and Rocky Mountain Division, 80th Annual Meeting: Progress and Sustainability in the 21st Century; April 13-16, 2005; Tucson, AZ.

Meko D. M., Hirschboeck K. K., Czyzowska E., Lee J. and Morino K. (2006a) Multi-basin drought and Arizona water supply, a tree-ring perspective. 22nd Pacific Climate Workshop, March 26-29. Pacific Grove, California.

Meko D. M. and Peristykh A. N. (1994) Tree-ring evidence for cyclic components in climate of the northern Great Plains, USA. EOS, Transactions, American Geophysical Union, 1994 Fall Meeting, November 1, 1994/Supplement, Vol. 75, No. 44, p. 81.

Morino K. A., Meko D. M. and Baisan C. H. (2002) Dendroclimatic Interpretration of Latewood

Width of Conifers from the Southwestern United States. 6th International Conference on Dendrochronology, 22-27 August, 2002. Quebec City, Quebec, Canada.

Skirvin S., Drake S., McClaran M., Marsh S. and Meko D. (2001a) Assessment of potential effects of climate change on vegetation in the San Pedro River watershed, southeastern Arizona. ArcGIS Southwest Users Group Conference Tucson, Arizona, October 24-26, 2001.

Skirvin S., Drake S., McClaran M., Marsh S. and Meko D. (2001b) Potential effects of climate change on the vegetation in the San Pedro River watershed, southeastern Arizona. Abstract available online: http://geology.wr.usgs.gov/sw-workshop/all-abstracts.pdf. Predicting hydrologic, geologic, and biologic responses to a drier and warmer climate in the desert Southwest, 23-25 April 2001. Tucson, Arizona.

Woodhouse C. A. and Meko D. M. (2001) Dendrohydrologic reconstructions: applications to water resource management, p. 161. 12th Symposium of Global Change and Climate Variations, Preprint Volume, No. 12.

Woodhouse C. and Meko D. M. (1997) Number of winter rainy days reconstructed from southwestern tree rings. In *Preprint Volume*, pp. 199-204. 8th Symposium on Global Change Studies. American Meteorological Society, Long Beach, California, 2/7.

Reports

Hirschboeck K. K. and Meko D. M. (2005) A tree-ring based assessment of synchronous extreme streamflow episodes in the Upper Colorado and Salt-Verde Tonto River Basins. Final Report to the Salt River Project, available online at: http://fp.arizona.edu/khirschboeck/srp.htm.

Meko D. M. (1981) Applications of Box-Jenkins Methods of time-series analysis to reconstruction of drought from tree rings. Ph.D. Dissertation, University of Arizona.

Meko D. M. (1990) A groundwater model of deep basin-fill aquifers of the Tohono O'odham Nation. Final Report for the Water Resources Department, Tohono O'odham Nation.

Meko D. M. (1991) Pilot study of mesquite and cottonwood trees as potential hydrologic indicators in the Tanque Verde Wash Area, Tucson, Arizona. Final Report submitted to Tucson Water, City of Tucson, 15 pp.

Meko D. M. (1992) *Preliminary climate chronology to 18,000 B.P. for the San Pedro River Basin*. Appendix A to Year 1 Progress Report, Evaluation of the effects of global climate change on the San Pedro River Watershed -- Part B, Climate Reconstruction Study.

Meko D. M. (1998) *Dendrohydrologic study of cottonwood trees (Populus angustifolia) in Great Sand Dunes National Monument*. Laboratory of Tree-Ring Research, University of Arizona, Tucson. 36 p.

Meko D. M. (2001) Western juniper tree-ring data as PDO resource. Oral presentation describing potential of recently collected tree-ring data for PDO reconstruction. Workshop on Grand Unified PDO Reconstruction. NOAA, Seattle, WA, 9/11.

Meko D. M. (2002) *Tree-ring study of hydrologic variability in the Peace-Athabasca Delta, Canada*. Report summarizing research project contracted to University of Arizona by law firm of Lawson Lundell, 1600 Cathedral Place, 925 West Georgia St., Vancouver, British Columbia, Canada V6C3L2.

Meko D. M. (2005) *Tree-ring reconstruction of annual and seasonal precipitation at Nogales, Arizona*. Appendix to: Generation and Analysis of Likely Hydrologic Scenarios for the Southern Santa Cruz River, HRC Technical Report No. 4, by Eylon Shamir, Konstantine P. Georgakakos, Nicholas E. Graham, and Jianzhong Wang; sponsored by the Arizona Department of Water Resources (Award No: 2005-2568). Hydrologic Research Center, 12780 High Bluff Drive, Suite 250, San Diego, CA 92130, USA. 36 p.

Meko D. M. and Graybill D. A. (1993) Tree-ring inferences on runoff in the Gila River basin. Proceedings of the Symposium on Effluent Use Management, and Abstracts -- AWRA 29th Annual Conference, p. 281. [Tucson AZ Aug29-Sept 2, 1993].

Meko D. M. and Psalti J. (2000) *Climate change and the stability of sky-island conifer populations in the Sonoran Desert region*. Final report, Agreement CFDA# 15.808, submitted to the U.S. Geological Survey, Biological Resources Division on June 26, 2000. University of Arizona, Tucson, AZ. 20 p.

Meko D. M. and Sieg C. H. (1995) Tree-Ring Collections in the Northern Great Plains in 1991 and 1992. Appendix to Final Report to the National Science Foundation, Grant No. ATM-9017155, 88 pp.

Curriculum Vitae

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Education

Ph. D. in Forest Ecology (1997)
Siberian Branch of Russian Academy of Science (SB RAS), V.N. Sukachev Institute of Forest
Krasnoyarsk, Russia

Dissertation advisor: Academician RAS E.A. Vaganov

B.S. and M.S. in Geography and Biology (1990)
Diploma with distinction from the State Teacher Training University
Krasnoyarsk, Russia

Academic Appointments

University of Arizona, Tucson, AZ

Aug. 2006 –present	Adjunct Assistant Professor of Dendrochronology Laboratory of Tree-Ring Research (LTRR)
2002-2006	Research Associate, LTRR
1999-2002	Research Scholar, LTRR
1998	Visiting Fulbright Scholar, LTRR

V.N. Sukachev Institute of Forest, SB RAS, Krasnoyarsk, Russia

1998-1997	Research Associate, Laboratory of Dendrochronology
1994-1997	Grad. Associate in Research, Laboratory of Dendrochronology
1992-1994	Research Assistant, Laboratory of Dendrochronology

State Teacher Training University, Krasnoyarsk, Russia

1999	Associate Professor of Geography, Department of Geography
1997-1998	Senior Lecturer, Department of Geography
1990-1996	Adjunct Assistant Professor, Department of Geography

Main Research Interests

Holocene climate variability
Development of climate proxies from tree rings
Modeling past climate variability

Central Asian Archaeology

Dating archaeological cultures with tree rings and radiocarbon wiggles
Assessment of past climate variability from archeological tree rings
Impact of climate change on past civilizations

Awards & Grants

Recent Principal Investigator

U.S. National Science Foundation (NSF)
BCS-Archaeological Program # 0207654 (2002-2006)
ATM-Earth System History Program # 0213696 (2002-2006)

Past Principal Investigator

United States Information Agency (CIES)
Research Fellowship from J. W. Fulbright Foreign Scholarship Board # 23102 (1998)

Siberian Branch of Russian Academy Sciences, Russia
Scientific Expertise Program (1998)
Krasnoyarsk Science Foundation (1996, 1997, 1999)

State Teacher Training University, St. Petersburg, Russia
Doctoral Teaching Felloship in Physical Geography (1991)

Collaboration and contribution to other projects

- Prof. S. W. Leavitt (University of Arizona) under the NSF-ESH project
- Prof. J. Dean (University of Arizona) under the NSF-BCS project
- Prof. C. Chang (Sweet Briar Collage, VA) under project "The Archaeology of Bronze Age and Iron Age Agro-pastoral Sites in Kazakhstan" (funded by National Geographic Society and NSF)
- Academician V. Molodin, Prof. N. Polosmak, Dr. V. Kubarev and I. Sljusarenko (Institute of Archaeology and Ethnography, SB Russian Academy of Science) under the NSF-BCS project
- Prof. A.Y. Alekseev and Dr. K. Chugunov (State Hermitage Museum) under the NSF-BCS project
- Dr. R.D. Hunter (Oakland University) under project on "Prehistoric underwater forests in Lake Huron, Michigan" funded by Coastal Management Program, Michigan Department of Environmental Quality and Oakland University Research Committee
- Prof. M. Hughes (University of Arizona) under project "Dendroclimatic study of Siberian boreal forest" (US Department, R19 #1753-300208)
- Academician E.A. Vaganov and Dr. M. Naurzbaev (Institute of Forest, SB RAS) under project "Reconstruction of long-term variability of summer temperature in northeast Siberia" (RFFI 96-04-4825)
- Prof. F.H. Schweingruber (Swiss Federal Institute for Forest, Snow, and Landscape Research) and Dr. S.G. Shiyatov (Institute of Plant Ecology, UB RAS) under project "Tree growth and climate change in the Ural-Siberian Subarctic" (CRDF RC1-279)

Scientific Presentations

Jan 1999 Tree-ring chronology from cell dimensions and climate reconstruction in the northeastern Siberia. INSTAAR Seminar (Institute of Arctic and Alpine Research), University of Colorado, Boulder, CO

Jan 1999 Tree-ring cell chronology and reconstruction of climate regime in the East Siberian subarctic from A.D. 1642. LTRR Seminar, University of Arizona, Tucson, AZ

Mar 2000 1,000-year history of environmental change in the Altai Mountains. LTRR Seminar, University of Arizona, Tucson, AZ

Aug 2002 Dendrochronology: Methods and Applications. Institute of Geography, Almaty, Kazakhstan

May 2005 Dates of Siberian Scythians from tree rings. Field Museum of Natural History, Chicago, IL

Apr 2006 Dendrochronology of larch in Russian Altai exposes misconceptions in Iron Age History of Asian Nomads. LTRR Seminar, University of Arizona, Tucson, AZ

Jun 2006 New dates of Pazyryk, Hun-Sarmatians and Turks cultures derived from tree rings in Altai. State Hermitage Museum, St. Ptersburg, Russia

Oct 2006 Chronology of Siberian Scythian Nomads from Tree Rings. Anthropology Department, University of Colorado, Boulder, CO

Service to Scientific Community

Peer Reviewing for Professional Journals and Committees

Tree-Ring Research (Journal)
Dendrochronologia (Journal)
Global Change Biology (Journal)
Annales Geophysicae (Journal of European Geophysical Union)
International Journal of Wildfire
U.S. National Science Foundation

Publications

Peer-reviewed Journal Articles

1. Leavitt S.W., **Panyushkina I.P.,** Lange T., Cheng L., Schneider A.F., Hughes J. 2006 (submitted). Radiocarbon "wiggles" in Great Lakes wood ca. 10,000 to 12,000 BP. *Radiocarbon*.

2. **Panyushkina I.P.,** Sljusarenko I.Y., Bikov N.I., Bogdanov E. 2006 (submitted). Floating larch tree-ring chronologies from archaeological timbers in the Russian Altai between 800 BC and 800 AD. *Radiocarbon*.
3. Leavitt, S.W., **Panyushkina I.P**., Lange T., Wiedenhoeft A., Cheng L., Hunter R.D., Hughes J., Pranschke F., Schneider A.F., Moran J., Stieglitz R., 2006. Climate in the Great Lakes region between 14,000 and 4,000 years ago from isotopic composition of conifer wood. *Radiocarbon* 48 (2): 205-217.
4. Hunter, R.D., **I.P. Panyushkina**, S.W. Leavitt, A.C. Wiedenhoeft, J. Zawiskie, 2006. A Multiproxy environmental investigation of Holocene wood from submerged conifer forest in Lake Huron, USA. *Quaternary Research* 66 (1):67-77.
5. **Panyushkina I.P.**, D.V. Ovtchinnikov, M.F. Adamenko, 2005. Mixed response of decadal variability in larch tree-ring chronologies from upper tree-lines of Russian Altai. *Tree-Ring Research* 61 (1): 33-42
6. **Panyushkina I.P**., Leavitt S.W., Wiedenhoeft A., Noggle S., Curry B., Grimm E. 2004. Tree-ring records of near-Younger Dryas time in Central North America- preliminary results from the Lincoln quarry site, central Illinois, USA. *Radiocarbon 46 (2):* 933-941
7. **Panyushkina I.P.,** Hughes M.K., Vaganov E.A. and Munro M.A.R. 2003. Summer temperature in northeastern Siberia since 1642 reconstructed from tracheids dimensions and cell numbers of *Larix cajanderi*. *Canadian Journal of Forest Research* 33: 1-10.
8. Ovtchinnikov D.V, **Panyushkina I.P,** Adamenko M.F. 2002. A 1,000-year tree-ring chronology of larch in the Altai Mountains and its application to summer temperature reconstruction. *Geography and Natural Resources (*In Russian): 102-108.
9. Danzer S.R., Leavitt S.W., **Panyushkina I.P**., Mergner A., Garcia E. and Best-Svob V. 2001. Xylem tracheid development in *Pinus resinosa* seeding in controlled environments. *Tree-ring Research* 57 (1): 45-54.
10. **Panyushkina I.P**, Ovtchinnikov D.V. 1999. Influence of climate on dynamics of radial increment in larch in the Altai Mountains. *Russian Journal of Forestry Sciences (Lesovedenie)* 6: 22-32.
11. Vlasenko V.I., Ovchinnikova T.M. and **Panyushkina I.P.** 1999. Dynamic of forest diversity in the Stolby reserve for the 20th century. *Botanical Research in Siberia* 7, IL-Krasnoyarsk: 54-72.
12. **Panyushkina I.P.,** Arbatskaya M.K. 1999. Dendrochronological approach to study of flammability of forests in Evenkiya (Siberia). *Siberian Journal of Ecology 2:* 167-173.
13. Vaganov E.A., **Panyushkina I.P.** and Naurzbaev M.M. 1997. Summer temperature reconstruction in eastern Taymir for the last 840 years. *Russian Journal of Ecology* 6: 403-407.
14. **Panyushkina I.P**., Vaganov E.A. and Shishov V.V. 1997. Dendroclimatic analysis of larch increment in northern Central Siberia. *Geography and Natural Resources* (Russian Journal) 2: 80-90.
15. **Panyushkina I.P.**, Vaganov E.A. and Shishov V.V. 1996. Spatial-temporal variation of radial tree growth in the north of Middle Siberia in relation to climate. *Dendrochronologia* 14: 115-126.
16. **Panyushkina I.P.**, Vaganov E.A. and Shishov V.V. 1996. Statistical analysis of larch tree-ring chronologies from the Siberian Arctic. *Geography and Natural Resources* (Russian Journal) 4: 93-103.

Peer-reviewed Book Chapters

1. Bikov N.I., Bikova B.A., **Panyushkina I.P**., Sljusarenko I.Y. 2004. Dates for Pazyryk culture tombs in the Altai derived from methods of dendrochronology, astronomy and land-surveying. In: Complex Studies of Ancient and Historical Societies of Eurasia. Eds.Y.F. Kiryushin and A.A. Tishkin. Barnaul, Publisher: Altai University, p 258-264.
2. **Panyushkina I.P**., Naurzbaev M.M. 2000. Climatic information in radial cell dimensions of larch tree rings. In: The Questions of the Pleistocene–Holocene Climate and Environment Reconstruction in Siberia. Vol.2 (book). Novosibirsk, p. 420-427.
3. **Panyushkina I.P**, Adamenko M.F. and Ovtchinnikov D.V. 2000. Application of the dendroclimatic network in the Altai Mountains for paleoenvironmental reconstruction with high-temporal resolution. In: The Questions of the Pleistocene–Holocene Climate and Environment Reconstruction in Siberia. Vol.2 (book). Novosibirsk, p. 413-419.

No-reviewed Book Chapters

1. Vaganov E.A., **Panyushkina I.P**. 1998. Biophysical basis of seasonal tree growth model. In: The Selected Chapters of Ecological Biophysics (book). Novosibirsk, Nauka, p. 84-100.

Technical Reports

Abstracts at International Conferences

1. **Panyushkina I.P**., S. W. Leavitt, 2006. Late Glacial-Early Holocene climate variability in the Great Lakes region from tree rings. AMQUA Program and Abstracts of the 19th Biennial Meeting: 137.
2. **Panyushkina I.P**., Sljusarenko I.Y., 2006. Larch dendrochronology derived from archaeological sites in Central Asia back to 800 B.C. Abstracts and Program of 9th International Conference on Dendrochronoogy:
3. **Panyushkina I. P**. 2006. Tree-ring growth in Russian Altai and climate change. Abstracts with program of the International conference on Climate Changes and Their Impact on Boreal and Temperate Forests (Ekaterinburg, June 5-7 2006): 74.
4. **Panyushkina I.P.** and Sljusarenko I.Y., 2006. Dendrochronology of the Iron Age in the Russian Altai: controversy between radiocarbon, archeological and tree ring dates. Abstracts & Program of the 19th Int. Radiocarbon Conference. Keble College, Oxford, April 3-7, 2006, p.184.
5. **Panyushkina I.P**., S. W. Leavitt, T. Lange, A. F. Schneider, 2005. Tree-Ring Investigation of an *in situ* Younger Dryas-Age Spruce Forest in the Great Lakes Region of N. America. *Eos Trans. AGU, 86*(52), Fall Meet. Suppl., Abstract PP13A/1484.
6. **Panyushkina I.P.**, I.Y. Sljusarenko, D.V. Ovtchinnikov, N.I. Bikov, 2004. Challenge in developing a long-term record of summer temperature from tree rings of variable sources and unknown locations in a mountain area. Abstracts of the Meeting on Tree Rings and Climate: Sharpening the Focus, Tucson, Arizona, p.88-90.
7. **Panyushkina, I.P**., S.W. Leavitt, 2004. High-resolution records of the Pleistocene-Holocene transition from tree rings in central North America. American Quaternary Association Biennial Meeting, Lawrence, Kansas, 26-28 June 2004.

8. Sljusarenko I., **Panyushkina I.**, Bykov N., Orlova L., Kuzmin Y. 2003. Chronology of the Scythian period sites in the Southeastern Altai: Dendrochronological and radiocarbon analysis. Program with abstracts of International Conference on Impact of the Environment on Human Migration in Eurasia: 15-18 November, St. Petersburg, Russia, p. 52.
9. Leavitt,S., **Panyushkina, I ,** 2003. Tree-ring records of near-Younger Dryas time in the U.S.Upper Midwest. In: Program and Abstracts of the 18th International Radiocarbon Conference Wellington, New Zealand, Sept. 1-5, p. 249.
10. **Panyushkina I.,** Leavitt, S. 2003. Tree-ring investigation of the Younger Dryas in the US Upper Midwest. XVI INQUA Congress Programs with Abstracts. July 23-30, Reno, NV, p. 165.
11. **Panyushkina I.**, Sljusarenko, I., Kubarev, V., Molodin V., Polos'mak. N. 2003. Environmental reconstruction from tree rings of archeological timbers in the Altai Mountains, Russia. XVI INQUA Congress Programs with Abstracts. July 23-30, Reno, NV, p. 77.
12. Ovtchinnikov, D., **Panyushkina I.** and Adamenko, M. 2002. A millennial tree-ring chronology as an indicator of early summer temperature in central Asia (Altai, Russia). Abstracts of 6th International Conference on Dendrochronology: Dendrochronology, Environmental Change and Human History. Quebec City, Canada, Aug. 22-27, p. 259.
13. **Panyushkina, I.,** Sljusarenko, I. 2002. Climatic interference from a floating tree-ring chronology of Pazyryk culture from the Altai Mountain, Russia. Abstracts of 6th International Conference on Dendrochronology: Dendrochronology, Environmental Change and Human History. Quebec City, Canada, Aug. 22-27, p. 261.
10. **Panyushkina I.**, Leavitt, S. and Noggle, S. 2002. A tree-ring study of wood of possible Younger Dryas age from central Illinois. Abstracts of 6th International Conference on Dendrochronology: Dendrochronology, Environmental Change and Human History. Quebec City, Canada, Aug. 22-27, p. 262.
11. **Panyushkina I.P**., Vaganov E.A. 2002. Regional applicability of a 1,000-year summer temperature reconstruction from Southern Siberia. Abstracts of 98th Annual Meeting of the Association of American Geographers, Los-Angeles, CA, March 19-23, 2002, p. 474.
12. Leavitt, S.W., **Panyushkina, I.P.,** Noggle, S. and Wiedenhoeft, A. 2002. A tree-ring study of wood of possible Younger Dryas age from central Illinois. Geological Society of America Annual Meeting. Denver, CO, 27-30 October 2002.
13. **Panyushkina, I.P.,** Hughes, M.K., Vaganov, E.A., Munro, M.A.R. 2001. Temperature regime of warm seasons in Siberian Arctic since 1642 AD reconstructed from cell dimension of larch tree rings. In: Tree Rings and People. International Conference on the Future of Dendrochronology. Davos, Switzerland, Sept. 22-26, p. 85.
14. **Panyushkina, I.P.**, Hughes, M.K., Vaganov, E.A., Munro, M.A.R. 2000. Cell dimensions- a possible source of age-independent proxy data from larch tree rings. Proceedings of Workshop on Plant Response to Environmental Changes on Global and Regional Scales. 25-29 Sept., Irkutsk, Russia, p. 167-168.
17. **Panyushkina I.P,** Adamenko M.F., Ovtchinnikov D.V. and Kiryankov, P.A. 2000. The Medieval Warm Period and Little Ice Age Climate Impact on Glacier and Forest in the Altai Mountains, South Siberia. Abstracts of American Geophysical Union Fall Meeting, EOS, Transactions, AGU, Vol. 81 (48), p. F 403.
18. **Panyushkina I.P**, Adamenko M.F., Ovtchinnikov D.V. 2000. Larch tree-ring variability on the climatic upper tree-line and climate change in the South Siberia. Abstracts of International Conference on Dendrochronology for the Third Millennium, Mendoza, Argentina, p. 237.
17. Vlasenko V.I, **Panyushkina I.P**. 1999. Stability of forest ecosystems in the Stolby reserve. Proceedings of Workshop on Assessment Methods of Forest Ecosystem Status and Sustainability (IUFRO). IL-Krasnoyarsk, Russia, p. 180-181.
18. **Panyushkina I.P.** 1998. The global climate change and larch growth in the Central Siberia.

PAGES Open Science Meeting, London, p. 98-99.

19. **Panyushkina I.P.**, Ovtchinnikov D.V. 1998. The reaction of larch radial growth to climate change in the Altai Mountains. Proceedings of IUFRO Intradivision Symposium-Larix-98: World Resources for Breeding, Resistance and Utilization. IL-Krasnoyarsk, Russia, p. 72-73.
20. Kirdyanov A.V., Shashkin E.A., **Panyushkina I.P.,** Arbatskaya M.K. 1997. Tree-ring growth, climate and fire frequency variability in forest ecosystems of the Enisey Transect. Proceedings of International Workshop on Spatial-Temporal Dimensions of High-Latitude Ecosystem Change (The Siberian IGBP Transect). IL-Krasnoyarsk, Russia, p. 48-49.
21. **Panyushkina I.P.** 1996. Spatial patterns of larch tree-ring variability in the northern Central Siberia. Proceedings of International Conference on Ecological-Physiological Aspects of Wood Formation in Conifer Plants. Krasnoyarsk, Russia, p. 93-96.
22. Vaganov E.A., **Panyushkina I.P**., Shishov V.V. 1995. Dendroclimatic study of boreal forest in the northern part of the Central Siberia. Proceedings of the International Symposium on Asian and Pacific Dendrochronology, Tsukuba, Japan, p. 52-57.

Abstracts at National Conferences

1. **Panyushkina, I.P.,** 2004. Toward a Dendrochronology to better understand Central Asian Archeology. In Proceedings of the American Association for the advancement of science (85th Annual Meeting of the Pacific Devision), Utah State University. June 13-17, Logan, UT, p.70.
2. **Panyushkina, I.P**, Naurzbaev, M.M. 2001. Siberian tree-rings related to climate and pacific teleconnections. Proceedings of the 18th Annual Pacific Climate Workshop, Pacific Grove, CA, March 18-21, p. 36-37.
3. **Panyushkina, I.P.**, Hughes, M.K., Vaganov, E.A., Munro, M.A.R. 2000. Cell dimensions: a possible source of age-independent proxy data from larch tree rings. Proceedings of the 17th Annual Pacific Climate Workshop. Two Harbors, CA, May 22-25, p. 117.
4. **Panyushkina I.P**. 1999. Links of larch tree-ring cell structure with climate: northern timber-line in the Yakutiya. Abstracts of Young Scientists SB RAS Conference. Novosibirsk, Russia, p. 15.
5. Vlasenko V.I., Ovchinnikova T.M., **Panyushkina I.P.** 1999. Assessment of forest ecosystems in the Stolby reserve. Proceedings of the 6th Conference on Productivity of Natural Resources of the Krasnoyarsk Territory. GPU-Krasnoyarsk, Russia, p. 32-33.
6. **Panyushkina I.P.** 1997. Larch growth and climate change in the Siberian Arctic. Proceedings of the Krasnoyarsk Science Center (SB RAS) Conference, KNS-Krasnoyarsk, Russia, p. 68-70.
7. **Panyushkina I.P.** 1997. Spatial classification of larch increment from north of Central Siberia. Proceedings of Conference on Methods of Geographical Research. Irkutsk, Russia, p. 35-37.

Teaching Experience

Courses taught at the Krasnoyarsk State Teacher Training University (in Russian)

Lecture courses:
Biogeography
Applied dendrochronology
Natural history of Krasnoyarsk territory (Central Siberia)

Seminar courses:

Physical geography of continents and oceans
Introductory to physical geography
Cartography

Field courses:
Meteorology
Geomorphology
Hydrology
Landscape ecology
Regional geography

Published university program:
Physical, social and economical geography of Krasnoyarsk Territory: Program for undergraduate students at Teacher Training Universities. KGPU, Krasnoyarsk, 1999, 21 p.

University program recommended for publishing:
Dendrochronology: methods and applications. Program for science graduate students at the Krasnoyarsk State University. KGU, Krasnoyarsk, 1999, 14 p.

Professional Societies

Tree-Ring Society
American Geophysical Union

Curriculum vitae

PAUL R. SHEPPARD

Chronology of Education

Ph.D. (1995); University of Arizona, Department of Geosciences; major: Paleoenvironmental-Quaternary Studies with an emphasis in Dendrochronology; minor: Soil and Water Sciences; dissertation: Reflected-light image analysis of conifer tree rings for dendrochronological re-search; dissertation director: Dr. Lisa Graumlich.

M.S. (1984); Cornell University, Department of Natural Resources; major: Forest Science; mi-nor: Statistics; thesis: Fire regime of the lodgepole pine (*Pinus contorta* var. *murrayana*) for-ests of the Mt. San Jacinto State Park Wilderness, California; thesis director: Dr. James Lassoie.

B.S. (1982); Humboldt State University, California, Department of Forestry; major: Forest Re-sources Management; secondary emphasis: vocal performance; graduated magna cum laude.

A.S. (1980); Long Beach City College, California, lower division general science.

Chronology of Employment

Assistant Professor, Laboratory of Tree-Ring Research, University of Arizona (since Aug. 2001): Conducting research, teaching, advising, and extension in dendrochronology.

Research Specialist and Adjunct Professor, Laboratory of Tree-Ring Research, University of Arizona (Sep. 1997 to Aug. 2001): Developed web-based teaching modules for dendrochro-nology, conducted research in environmental sciences using dendrochronology, and taught.

NSF-NATO Post-Doctoral Fellow, Departamento de Ecología, Universidad de Barcelona, España (Sep. 1996 to Aug. 1997): With Dr. Emilia Gutiérrez, researched effects of soil mi-crosite conditions on tree growth, and collaborated with other dendrochronologists of NATO-member countries.

Visiting Assistant Professor, Laboratory of Tree-Ring Research, University of Arizona (Sep. 1995 to Aug. 1996): Taught Introduction Survey, Advanced Workshop, and Graduate Semi-nar courses in Dendrochronology, advised students, and conducted research in environmental science.

Graduate Research and Teaching Associate, Laboratory of Tree-Ring Research, University of Arizona (Jan. 1989 to Aug. 1995): Assisted Dr. Lisa Graumlich on tree-ring research from the upper-Midwest, Sierra Nevada, northwestern Alaska, and China, and assisted Global Change course.

Senior Research Assistant, Tree-Ring Laboratory, Lamont-Doherty Geological Observatory, Co-lumbia University (Sept. 1984 to Dec. 1988): Assisted tree-ring projects in forest ecology, climatology, and seismology.

Honors and Awards

University of Arizona College of Science Distinguished Early Career Teaching Award (2005)

Accepted as Associate Investigator into the Arizona Cancer Center (2005)

University of Arizona College of Science Staff Recognition Award of Excellence (2000)

Diploma Básico de Español Como Lengua Extranjera (Basic Diploma of Spanish as a Foreign Language) (1998)

NSF-NATO Post-Doctoral Fellowship to Spain (1996–1997)

University of Arizona Geoscience Days "Best Talk in Geomorphology" (1993 & 1994)

A.E. Douglass Award, Laboratory of Tree-Ring Research, University of Arizona (1991)

Student Grant, Graduate College, University of Arizona (1989)

Andrew Mellon Foundation Grant, Cornell University (1983)

Senior Man of the Year, Humboldt State University (1982)

Speaker, School of Natural Resources Commencement, Humboldt State University (1982)

Editor, Annual Ring Yearbook, Forestry Department, Humboldt State University (1982)

Faculty Association Scholarship, Long Beach City College, California (1979)

Boy Scouts of America Eagle Scout, Double Silver Palms (1972)

Service/Outreach (last 5 years)

<u>Local/State</u>

Arizona Envirothon, forest and environmental science content and testing, 2001–2006

Society of American Foresters and the Asociación Mexicana de Profesionales Forestales Sección Chihuahua, 20th Reunion, tours in Spanish of the Laboratory of Tree-Ring Research, Novem-ber, 2005

Society of American Foresters, Southwestern Section, Southern Arizona Chapter, field tour guide during Section Meeting hosted in Tucson, May, 2002

<u>National/International</u>

Session Chair, 7th International Conference on Dendrochronology, Beijing, June, 2006

Instructor, 1st Central American Dendrochronological Workshop and Fieldweek, Chiquimulas, Guatemala, March, 2006 (all in Spanish)

Annual Meeting of the Ecological Society of America, Tucson, August, 2003, organized and led tours of the Laboratory of Tree-Ring Research

Session Chair, 6th International Conference on Dendrochronology, Québec City, August, 2002

Instructor, 11th Annual North American Dendroecological Fieldweek, Saltillo, Coahuilla, Mex-ico, August, 2001 (in Spanish and English)

Sheppard, P.R. 2001. Book review of "Dendrochronology in Monsoon Asia." Wood and Fiber Science 33:314-315.

Departmental Committees

Laboratory of Tree-Ring Research Departmental Talk Series Coordinator, various semesters

Department co-host (with Dr. Malcolm Hughes) for upcoming long-term Haury visiting scholar Dr. Qibin Zhang, from Beijing, Fall, 2006

Department host for long-term Haury visiting scholar Dr. Regmi Dhanajay, from Nepal, spring and summer, 2006

Department host for short-term visiting scholar Mr. Russell Weaver, from Vancouver, Washing-ton, summer, 2006

Department host for long-term visiting scholar Dr. José Miguel Olano, from Spain, spring, 2006

Guest lecturer, summer pre-session dendrochronology courses, on crossdating, dendrochemistry, dendrogeomorphology, and dendroclimatology in China (4 lectures), May, 2006

Guest lecturer, Introduction to Dendrochronology course, on dendrogeomorphology and dendro-chemistry (3 lectures), Fall, 2005

Guest lecturer, summer pre-session dendroecology course, on dendroecology (1 lecture), May, 2005

Guest co-lecturer (with Dr. Mark Elson), IGERT seminar, Department of Anthropology, Univer-sity of Arizona, “Redating the Sunset Crater eruption: Dendrochemical analysis of trees af-fected by cinder cone eruptions,” Spring, 2005

Guest lecturer, Introduction to Dendrochronology course, on dendrogeomorphology and dendro-chemistry (3 lectures), Fall, 2004

Students Across Borders, Department of Geosciences, dendrochronology instructor for week-long field camp for Hispanic students from Arizona and Sonora to learn geosciences topics and techniques, June, 2003–2005

Department host for long-term visiting scholar Ms. Deanne Drake, from University of Washing-ton, Spring, 2002

Guest speaker, UA Soil, Water, and Environmental Science Soils Club, October, 2002

Guest lecturer, Introduction to Dendrochronology course, on dendrogeomorphology (2 lectures), Fall, 2002

Guest lecturer, Introduction to Dendrochronology course, on dendrogeomorphology (2 lectures), Fall, 2001

College Committees

5-Year Review Panel for Dr. Tom Swetnam as Director of the Laboratory of Tree-Ring Re-search, 2005–2006

College of Science, Dean's Galileo Circle field trips, co-organizer and co-leader for forest sci-ence and cultural history topics, 2003–2006

University Committees

University of Arizona Faculty-Staff Choir, since 2000

Other Committees

Peer reviewer for scientific journals, four manuscripts so far in 2006

Peer reviewer for scientific journals, seven manuscripts in 2005

Peer reviewer for scientific journals, six manuscripts in 2004

Peer reviewer for scientific journals, four manuscripts in 2003

Peer reviewer for scientific journals, six manuscripts in 2002

Peer reviewer for scientific journals, four manuscripts in 2001

Tree-Ring Society, member since 2001

Soil Science Society of America, member since 1994

American Quaternary Association, member since 1994

Society of American Foresters, member since 1980

Publications/Creative Activity (Published or Accepted)

Chapters in scholarly books and monographs

Nash, S.E. and Sheppard, P.R. Climate and Environment in the American Southwest. Chapter in Archaeology in America, edited by F.P. McManamon, L.S. Cordell, K. Lightfoot, and G.R.

Milner, Greenwood Publishing, Westport, Connecticut. In press. (This chapter is a review of the state of the field, and the book is a scholarly work.)

Refereed journal articles (* indicates related to thesis or dissertation work)

*Sheppard, P.R. and J.P. Lassoie. 1986. A nondestructive method for dating living, fire-scarred trees in wilderness areas. Pp. 35–38 in Proceedings, 1985 National Wilderness Research Con-ference: Current Research (Ft. Collins, CO), R.C. Lucas, compiler. USDA For. Serv. Gen. Tech. Rep. INT-212.

Sheppard, P.R. and E.R. Cook. 1988. Scientific value of trees in old-growth natural areas. Natu-ral Areas Journal 8(1):7–12.

Jacoby, G.C., P.R. Sheppard, and K.E. Sieh. 1988. Irregular recurrence of large earthquakes along the San Andreas fault: evidence from trees. Science 241:196–199.

*Sheppard, P.R., J.E. Means, and J.P. Lassoie. 1988. Crossdating cores as a nondestructive method for dating living, scarred trees. Forest Science 34(3):781–789.

Sheppard, P.R. and G.C. Jacoby. 1989. Application of tree-ring analysis to paleoseismology: two case studies. Geology 17:226–229.

*Sheppard, P.R. 1993. Identifying low-frequency tree-ring variation. Tree-Ring Bulletin 51(1991):29–38.

*Sheppard, P.R. and L.O. White. 1995. Tree-ring responses to the 1978 earthquake at Stephens Pass, northeastern California. Geology 23:109–112.

*Sheppard, P.R. and L.J. Graumlich. 1996. A reflected-light video imaging system for tree-ring analysis of conifers. Pp. 879–889 in Proceedings of the 1994 International Conference on Tree Rings, Environment, and Humanity (Tucson, AZ), J.S. Dean, D.M. Meko, and T.W. Swetnam, editors. Tucson: Radiocarbon, Department of Geosciences, The University of Ari-zona.

*Sheppard, P.R., L.J. Graumlich, and L.E. Conkey. 1996. Reflected-light image analysis of conifer rings for reconstructing climate. Holocene 6(1):62–68.

Sheppard, P.R., R.L. Holmes, and L.J. Graumlich. 1997. The "many fragments curse": a special case of the segment length curse. Tree-Ring Bulletin 54:1–9.

*Sheppard, P.R. and J.P. Lassoie. 1998. Fire regime of the lodgepole pine of Mt. San Jacinto, California. Madroño 45(1):47–56.

*Sheppard, P.R. 1999. Overcoming extraneous wood color variation during low-magnification reflected-light image analysis of conifer tree rings. Wood and Fiber Science 31(2):106–115.

Sheppard, P.R. and T.L. Thompson. 2000. Effect of extraction pretreatment on temporal varia-tion of nitrogen in tree rings. Journal of Environmental Quality 29:2037–2042.

Sheppard, P.R., P. Casals, and E. Gutiérrez. 2001. Relationships between ring-width trends and soil nutrient availability at the tree scale. Tree-Ring Research 57:105–113.

Sheppard, P.R., A.C. Comrie, K. Angersbach, G.D. Packin, and M.K. Hughes. 2002. The cli-mate of the US Southwest. Climate Research 21(3):239–258.

Sheppard, P.R. 2002. Web-based tools for teaching dendrochronology. Journal of Natural Re-sources and Life Sciences Education 31:123–130.

Grissino-Mayer, H.D., P.R. Sheppard, and M.K. Cleaveland. 2004. A dendroarchaeological re-evaluation of the “Messiah” violin and other instruments attributed to Antonio Stradivari. Journal of Archaeological Science 31:167–174.

Sun, N.N., C.D. Fastje, S.S. Wong, P.R. Sheppard, G. Ridenour, J.D. Hyde, S. Macdonald, and M.L. Witten. 2003 (published 2004). Dose-dependent transcriptome changes by metal ores on a human acute lymphoblastic leukemia cell line. Toxicology and Industrial Health 19:157–163.

Sheppard, P.R., P.E. Tarasov, L.J. Graumlich, K.-U. Heussner, M. Wagner, H. Österle, and L.G. Thompson. 2004. Annual precipitation since 515 BC reconstructed from living and fossil juniper growth of northeastern Qinghai Province, China. Climate Dynamics 23:869–881.

Sheppard, P.R., E.M. May, M.H. Ort, K.C. Anderson, and M.D. Elson. 2005. Dendrochro-nological responses to the 24 October 1992 tornado at Sunset Crater, northern Arizona. Cana-dian Journal of Forest Research 35:2911–2919.

Sheppard P.R. and M.L. Witten. 2005. Laser trimming tree-ring cores for dendrochemistry of metals. Tree-Ring Research 61(2):87–92.

Sheppard P.R., G. Ridenour, R.J. Speakman, and M.L. Witten. 2006. Elevated tungsten and co-balt in airborne particulates in Fallon, Nevada: possible implications for the childhood leuke-mia cluster. Applied Geochemistry 21:152–165.

Sheppard, P.R., R.J. Speakman, G. Ridenour, and M.L. Witten. 2006. Reply to comment on "Elevated tungsten and cobalt in airborne particulates in Fallon, Nevada: Possible implica-tions for the childhood leukemia cluster", by R. Seiler. Applied Geochemistry 21:715–723.

Sheppard, P.R., R.J. Speakman, G. Ridenour, and M.L. Witten. 2006. Reply to comment on "Elevated tungsten and cobalt in airborne particulates in Fallon, Nevada: Possible implica-tions for the childhood leukemia cluster", by Blasland, Bouck & Lee, Inc. Applied Geochem-istry 21:1086–1091.

Sheppard, P.R. and S.Y. Singavarapu. 2006. Solving the "magnification irony" in reflected-light image analysis of conifer tree rings using a microscope. Journal of Imaging Science and Technology 50(3):304–308.

Sheppard, P.R., R.J. Speakman, G. Ridenour, and M.L. Witten. 2006. Using lichen chemistry to assess airborne tungsten and cobalt in Fallon, Nevada. Environmental Monitoring and As-sessment, now available on-line.

Sheppard, P.R., R.J. Speakman, C. Farris, and M.L. Witten. 2006. Multiple environmental monitoring techniques for assessing spatial patterns of airborne metals. Environmental Sci-ence & Technology, now available on-line.

Sheppard, P.R. and A. Wiedenhoeft. 2007. An advancement in removing extraneous color from wood for low-magnification reflected-light image analysis of conifer tree rings. Wood and Fi-ber Science, 39(1): in press.

Electronic Publication

Sheppard, P.R. 1998. Crossdating tree rings using skeleton plotting. Available at: http://tree.ltrr.arizona.edu/skeletonplot/introcrossdate.htm. Not peer reviewed per se, but an article about this work is peer reviewed.

Work in Progress

Sheppard, P.R., R.J. Speakman, G. Ridenour, M.D. Glascock, C. Farris, and M.L. Witten. Spa-tial patterns of tungsten and cobalt in surface dust of Fallon, Nevada. Environmental Geo-chemistry and Health. In final review after revision.

Sheppard, P.R., R.J. Speakman, G. Ridenour, and M.L. Witten. Temporal variability of tung-sten and cobalt in Fallon, Nevada. Environmental Health Perspectives. In final review after revision.

Sheppard, P.R., K. Rhodes, E. Schumacher, P. Toepfer, G. Ridenour, and M.L. Witten. Mor-phological and chemical characteristics of airborne tungsten particles of Fallon, Nevada. Mi-croscopy and Microanalysis. In final review after revision.

Sheppard, P.R., M.H. Ort, K.C. Anderson, L. Vázquez-Selem, R.J. Speakman, and M.D. Elson. In review. Dendrochronological responses to the 1943–1952 eruption of Parícutin Volcano, Michoacán, Mexico. Bulletin of Volcanology. In peer review.

Sheppard, P.R., M.H. Ort, K.C. Anderson, M. Clynne, E.M. May, R.J. Speakman, and M.D. Elson. Dendrochronological responses to the 1660s eruption of Cinder Cone, Lassen Volcanic National Park. In preparation.

Elson, M.D., M.H. Ort, P.R. Sheppard, and K.C. Anderson. The Sunset Crater eruption: re-examining a classic date in the prehistoric American Southwest. In preparation.

Sheppard, P.R., R.J. Speakman, C. Fastje, and M.L. Witten. Temporal variability of tungsten in Sierra Vista and Willcox, Arizona. In preparation.

Fastje, C.D., Y. Yemane, K.H. Le, J.M. Cobb, Y.Z. Tufail, E.L. Meigs, A.N. Thomas, B.K. Erly, D.B. Ostroff, N.A. Thiltges, T.M. Neitzke, J.E. Haley, P.R. Sheppard, and M.L. Witten. In utero exposure to sodium tungstate in C57BL/6 pups induces transcriptome changes associ-ated with carcinogenesis. In preparation.

Sheppard, P.R. Growth trends in high-elevation pines downwind of Los Angeles related to air pollution. In preparation.

Media

Performances

As an active member of the University of Arizona Faculty-Staff Choir since 2000, I have per-formed numerous times at official functions of the University, including department and col-lege commencement receptions, other awards ceremonies, retirement parties, holiday gather-ings, and athletic games for the National Anthem.

Scholarly Presentations (last five years)

Colloquia

Sheppard, P.R. Dendrogeomorphology. Presentation to the Department of Geology, Northern Arizona University, Flagstaff, Arizona, April, 2003. Invited.

Sheppard, P.R. Fire ecology in forested ecosystems of Arizona. Arizona Wetlands Conference, Pinetop, Arizona, April, 2003. Invited.

Sheppard, P.R. Past climate variability in the Southwest, with implications to prehistoric cul-tures. Presentation to the Q Ranch Archaeology Dig, Q Ranch, Mogollon Rim, Arizona, June, 2003. Invited.

Sheppard, P.R. Reacciones arbóreas a la erupción volcánica de Parícutin [Tree-growth reactions to the eruption of Paricutin]. Oral report in Spanish to the indigenous community of Nuevo San Juan Parangaricutiro. March, 2004. Submitted.

Sheppard, P.R. Tree-ring research in Sierra Vista. Monthly meeting of Pima County Environ-mental Quality Advisory Council, April 21, 2004. Invited.

Sheppard, P.R. First dendrochemical results from Volcán Parícutin, Michoacán, Mexico, with implications for Sunset Crater. Laboratory of Tree-Ring Research Departmental Talk, 2004. Submitted.

Sheppard, P.R. Dendrochronology of the Sunset Crater tornado. Laboratory of Tree-Ring Re-search Departmental Talk, Spring, 2004. Submitted.

Sheppard, P.R. Drought in the Southwest. Comprehensive Watershed Management for the Val-ley of the Sun and Central Arizona Basins, Phoenix, November 20, 2004. Invited.

Sheppard, P.R. and M.L. Witten. Elevated tungsten and cobalt in airborne particulates in Fallon, Nevada: possible implications for the childhood leukemia cluster. Combined Laboratory of Tree-Ring Research and Pediatrics Departmental Talk, Fall, 2005. Submitted.

Sheppard, P.R. Laser trimming tree-ring cores for dendrochemistry of metals. Laboratory of Tree-Ring Research Departmental Talk, Fall, 2005. Submitted.

Sheppard, P.R. Image analysis of conifer tree rings: A case study from ponderosa pine of the Manzano Mountains., New Mexico. Laboratory of Tree-Ring Research Departmental Talk, Spring, 2006. Submitted.

Sheppard, P.R. Dendrochronology in the American Southwest. Presentation to Yale School of Forestry annual field trip, Tucson, June 2006. Invited.

Sheppard, P.R. and M.L. Witten. Environmental and biomedical sciences combined in leukemia research. Frontiers in Medical Research, dual talk scheduled for October 31, 2006. Invited.

Conferences

Grissino-Mayer, H.D., P.R. Sheppard, and M.K. Cleaveland. 2001. Dendrochronological dating of stringed instruments: a re-evaluation. 29th Annual Convention of the Violin Society of America, November 8–11, 2001, Carlisle, Pennsylvania. Invited oral.

B.J. Morehouse, M.F. Glueck, R.C. Bales, A.C. Comrie, R.H. Carter, and P.R. Sheppard. 2001. A vertically integrated assessment of climate impacts on water supply in Arizona. 81st Annual Meeting of the American Meteorological Society, January 2001, Albuquerque, New Mexico. Submitted poster.

Sheppard, P.R. 2002. Overcoming the magnification irony in reflected-light image analysis of tree rings. 6th International Conference on Dendrochronology, August 22–27, 2002, Québec City. Submitted poster.

Sheppard, P.R. and M.A. Topa. 2002. Physical-chemical pretreatment of wood for measuring tree-ring nitrogen. 6th International Conference on Dendrochronology, August 22–27, 2002, Québec City. Submitted oral.

Kang, X.-C., L.J. Graumlich, P.R. Sheppard, and Q.-B. Zhang. 2002. A millennium-long tree-ring chronology of Sabina przwalkii in the Tianjun area of eastern Qinghai-Tibet

Plateau. 6th International Conference on Dendrochronology, August 22–27, 2002, Québec City. Submit-ted poster.

Sheppard, P.R. and M.A. Topa. 2003. Pretreatment of wood for measuring tree-ring nitrogen. Pan-American Regional Group Meeting of IAWA, July 13–17, 2003, Portland, Oregon. Sub-mitted oral.

Sheppard, P.R. 2003. Removing heartwood and other discoloration from wood for reflected-light image analysis of conifer tree rings in dendrochronology. Pan-American Regional Group Meeting of IAWA, July 13–17, 2003, Portland, Oregon. Submitted oral.

Butler, R.F., P. Kresan, A. Baez, P.R. Sheppard, G. Forger, G. Rendon-Coke, and F. Gray. 2003. Students Across Borders: A Summer Earth Science Workshop for Hispanic High School Students. Fall Meeting of the American Geophysical Union, December, 2003. Submit-ted poster.

Sheppard, P.R. and M.L. Witten. 2003. Dendrochemistry of urban trees in an environmental exposure analysis of childhood leukemia cluster areas. Fall Meeting of the American Geo-physical Union, December, 2003. Submitted oral.

Sheppard, P.R., M.D. Elson, M.H. Ort, R.J. Speakman, and K.C. Anderson. 2004. Dendro-chemical analysis of trees affected by cinder cone eruptions: A new technique for re-analyzing the Sunset Crater eruption. Archeological Sciences of America Symposium, Uni-versity of Arizona, September, 2004. Submitted oral.

Ort, M.H., P.R. Sheppard, R.J. Speakman, K.C. Anderson, M.D. Elson, and G.C. Siebe 2004. Dendrochemical dating of tephra layers. Fall Meeting of the American Geophysical Union, December, 2004. Submitted oral.

Sheppard, P.R. and M.L. Witten. 2004. Heavy metal content in airborne dust of childhood leu-kemia cluster areas: even small towns have air pollutants. Fall Meeting of the American Geo-physical Union, December, 2004. Submitted poster.

Sheppard, P.R., M.H. Ort, K.C. Anderson, R.J. Speakman, and M.D. Elson. 2005. Dendro-chemical analysis of trees affected by cinder cone eruptions: a new technique for re-analyzing the Sunset Crater eruption. 80th Annual Meeting of the American Association for the Ad-vancement of Science, Southwestern and Rocky Mountain Division, University of Arizona, Tucson, April 13–16, 2005. Submitted oral.

Sheppard, P.R., M.H. Ort, R.J. Speakman, K.C. Anderson, and M.D. Elson. 2005. Dendro-chemical analysis of trees affected by the Parícutin eruption, with implications for re-analyzing the Sunset Crater eruption. Annual Meeting of the Geological Society of America, October, 2005. Submitted oral.

Sheppard, P.R. and M.L. Witten. 2005. Heavy metal content in airborne dust of childhood leu-kemia cluster areas: even small towns have air pollutants. Arizona Health Sciences Center Frontiers in Biomedical Research Poster Forum, October 28, 2005. Submitted poster.

Sheppard P.R., R.J. Speakman, G. Ridenour, M.D. Glascock, C. Farris, and M.L. Witten. 2005. Spatial patterns of airborne exposures of tungsten and cobalt in Fallon, Nevada, from lichens and surface sediments. Fall Meeting, American Geophysical Union, December, 2005. Submit-ted poster.

Fastje, C.D., N.N. Sun, Y.Z. Tufail, J.E. Haley, C.R. Nardi, B.R. Herrin, T.M. Neitzke, A.N. Thomas, K.H. Le, Y. Yemane, N.A. Thiltges, D.B. Ostroff, R.S. Camponovo, J.L. Begay, B.K. Erly, S. Tekle, E.L. Meigs, J.M. Cobb, S.S. Wong, P.R. Sheppard, and M.L. Witten. 2006. Genetic analysis of leukemia cluster models. Experimental Biology Conference: Ad-vancing the Biomedical Frontier, April 5, 2006. Submitted poster.

Sheppard, P.R. and M.L. Witten. 2006. Laser trimming tree-ring cores for dendrochemistry of metals. 7th International Conference on Dendrochronology, Beijing, China, June 11–17, 2006. Submitted poster.

Sheppard, P.R. and M.L. Witten. 2006. Dendrochemistry of urban trees in an environmental exposure analysis of childhood leukemia cluster areas. 7th International Conference on Den-drochronology, Beijing, China, June 11–17, 2006. Submitted oral.

Sheppard, P.R. 2006. Image analysis of ponderosa pine to reconstruct summer-only precipita-tion in central New Mexico. 7th International Conference on Dendrochronology, Beijing, China, June 11–17, 2006. Submitted oral.

Sheppard, P.R., M.H. Ort, K.C. Anderson, R.J. Speakman, and M.D. Elson. 2006. Dendro-chemical analysis of trees affected by cinder cone eruptions: a new technique for re-analyzing the Sunset Crater eruption. 7th International Conference on Dendrochronology, Beijing, China, June 11–17, 2006. Submitted poster.

Sheppard, P.R., E.M. May, M.H. Ort, K.C. Anderson, and M.D. Elson. 2006. Dendrochro-nological responses to the 24 October 1992 tornado at Sunset Crater, northern Arizona. 7th In-ternational Conference on Dendrochronology, Beijing, China, June 11–17, 2006. Submitted poster.

May, E.M., P.R. Sheppard, M.D. Elson, M.H. Ort, and K.C. Anderson. 2006. Human adaptation to the 11th century eruption of Sunset Crater volcano, northern Arizona. Annual Meeting of the Geological Society of America. Scheduled for October, 2006. Submitted oral.

Grants and Contracts Funded

<u>Federal</u>

Sheppard, P.R. (100% PI). 1996. Postdoctoral study and collaboration in Departamento de Eco-logía, Universidad de Barcelona, Spain. National Science Foundation, NATO Postdoctoral Fellowship in Science and Engineering, 12 months, $45,000.

Sheppard, P.R. (100% PI). 2000. Measuring and interpreting Nitrogen in tree rings. National Science Foundation, Ecology Small Grant for Exploratory Research, 1 year, $60,000.

Sheppard, P.R. (33% Co-PI, with 56% of the budget), M.H. Ort., M.D. Elson. 2004. Collabora-tive Research: Dendrochronological, volcanological, and archaeological study of cinder cone eruptions of Parícutin and Sunset Crater (collaboration with NAU Geology and Desert Ar-chaeology). National Science Foundation, Petrology and Geochemistry, 2 years, $179,927.

Witten, M.L. and Sheppard, P.R. (40% Co-PI, with 40% of the budget). 2007. Fallon leukemia study. U.S. Environmental Protection Agency, 1 year, $160,000.

Private Foundation

Sheppard, P.R. (100% PI). 2003. Temporal and Spatial Environmental Exposure Assessment Around Childhood Leukemia Clusters: A Combined Dendrochemistry and Inhalable Air Study. Cancer Research and Prevention Foundation, 2 years, $70,000.

Witten, M.L. and Sheppard, P.R. (30% Co-PI). 2003. Dendrochronology in a Tungsten Expo-sure Study of Childhood Leukemia Clusters. The Gerber Foundation, 1 year, $109,661.

University of Arizona

Sheppard, P.R. (100% PI). 2000. Web-based educational modules applying tree-ring data to environmental science issues. University of Arizona New Learning Environments and Instruc-tional Technologies Grants Program, 1 year, $18,600.

Sheppard, P.R. (100% PI). 2001. Solving the "magnification irony" in reflected-light image analysis of conifer tree rings using a microscope. University of Arizona Small Grants Pro-gram in Imaging and Image Science, 1 year, $7,500.

Sheppard, P.R. (100% PI). 2002. Foreign Travel Grant to Attend 6th Annual International Con-ference in Dendrochronology. University of Arizona International Affairs Office, 1 year, $300.

Sheppard, P.R. (100% PI). 2006. Foreign Travel Grant to Attend 7th Annual International Con-ference in Dendrochronology. University of Arizona International Affairs Office, 1 year, $800.

Curriculum Vitae
THOMAS WILLIAM SWETNAM

December 2006

EDUCATION

- University of New Mexico, B. S., 1977, General Biology, Chemistry
- University of Arizona, M. S., 1983, Ph.D. 1987, Watershed Management, Dendrochronology

EMPLOYMENT

- 2000 to Present: Director & Professor of Dendrochronology, Laboratory of Tree-Ring Research; joint appointments in School of Renewable Natural Resources, Ecology & Evolutionary Biology, and adjunct appointment in Geography and Regional Development
- 1994-1999: Associate Professor of Dendrochronology, Laboratory of Tree-Ring Research
- 1988-1994: Assistant Professor of Dendrochronology, Laboratory of Tree Ring Research
- 1987-1988: Research Associate, Laboratory of Tree-Ring Research, University of Arizona
- 1980-1987: Graduate Assistant in Research, subsequently Graduate Associate in Research, Laboratory of Tree-Ring Research, University of Arizona
- 1978-1980: Forestry Technician, Gila Wilderness, New Mexico, U. S. Forest Service
- 1976-1977: Park Technician, Grand Canyon National Park, Arizona, National Park Service

AWARDS & HONORS

- A. E. Douglass Award University of Arizona (1983)
- Visiting fellow at Aldo Leopold Wilderness Research Institute, Missoula Montana (1994)
- Walter Orr Roberts Lecturer, Aspen Global Change Institute, Aspen Colorado (1999)
- Weaver Lecturer, School of Forestry and Wildlife Science, Auburn University (2000)
- William Skinner Cooper Award, Ecological Society of America, for outstanding paper, with Julio Betancourt (2001)
- Henry Cowles Award, The Association of American Geographers, Biogeography Specialty Group, for outstanding paper with James Speer (2002)

APPOINTMENTS & ADVISORY BOARDS

- Member, Board of Trustees, Valles Caldera National Preserve (appointed by President William J. Clinton (2000-2004)
- Member, Governor's Forest Health Advisory Council (appointed by Arizona Governor Janet Napolitano (2003-2006)
- Member, Governor's Climate Change Advisory Group (appointed by Arizona Governor Janet Napolitano (2005-2006)
- Member, Science Advisory Board, Malpais Borderlands Group, New Mexico (2003-present)

- Member, Board of Advisors, Institute for Natural Resource Management, NSF-EPSCOR Program, New Mexico (2003-present)
- Member, Board of Advisors, NSF-EPSCOR Ecology Program, Wyoming (2005-present)
- Member (and founder), Board of Advisors, International Multiproxy Paleofire Database, National Climate Data Center, NOAA (2002-present)
- Member & Chair, Board of Advisors, NOAA Paleoclimatology Program (2004-2005)
- Member of Executive Committee, Consortium for Integrated Climate Research in Western Mountains (CIRMOUNT) (2003-2006)

EDITORIAL

- Associate Editor, *International Journal of Wildland Fire*, 1993-present
- Editor, *Tree-Ring Research* (formerly *Tree-Ring Bulletin*) 2000-2001
- Associate Editor, *Ecoscience*, 1994-1998
- Associate Editor, *Canadian Journal of Forest Research*, 1998
- Editorial Board, *Ecological Applications*, 1998-1999
- Associate Editor, *Dendrochronlogia*, 2005-present
- Co-Editor with J. Dean and D. Meko on special issue of *Radiocarbon*, 1996

PUBLICATIONS (by type and chronological order)

Edited Books:

1. Dean, J. S., D. M. Meko, and **T. W. Swetnam**, editors. 1996. Tree Rings, Environment, and Humanity, Proceedings of the International Conference, Tucson, Arizona, 17-21 May, 1994. Radiocarbon, Tucson Arizona. 889 pp.

2. Veblen, T. T., W. Baker, G. Montenegro, and **T. W. Swetnam**. Editors. 2003. Fire and Climatic Change in Temperate Ecosystems of the Western Americas. Ecological Studies Vol. 160. Springer, New York. 444 pp.

Chapters in Books:

3. **Swetnam, T. W**. and 9 other authors (all listed alphabetically). 1991. Biosphere-Climate Interactions during the past 18,000 years: Towards a Global Model of the Terrestrial Biosphere. pages 25-42, In: R. S. Bradley, ed., Global Changes of the Past, Papers arising from the 1989 OIES Global Change Institute, Snowmass, Colorado, 24 July - 4 August, 1989. UCAR/Office for Interdisciplinary Earth Studies.

4. **Swetnam, T. W.**, and J. L. Betancourt. 1992. Temporal patterns of El Niño/Southern Oscillation - wildfire patterns in the southwestern United States. pages 259-270 In Diaz H. F. and V. M. Markgraf, eds., El Niño: Historical and Paleoclimatic Aspects of the Southern Oscillation, Cambridge University Press, Cambridge.

5. Wickman, B. E., R. R. Mason, and **T. W. Swetnam.** 1994. pages 251-261. Searching for long-term patterns of forest insect outbreaks. In: S. R. Leather, K. F. A. Walters, N. J. Mills, and A. D.

Watt, eds., Individuals, Populations and Patterns in Ecology, Intercept Press, Andover, United Kingdom.

6. Allen, C. D., R. Touchan, and **T. W. Swetnam.** 1996. Overview of fire history in the Jemez Mountains, New Mexico. pp.35-36, in The Jemez Mountains Region : New Mexico Geological Society, Forty-seventh Annual Field Conference, September 25-28, eds. Fraser Goff, B. S. Kues, M. A. Rogers, L. D. McFadden, and J. N. Gardner. Albuquerque, N.M.

7. **Swetnam, T. W.** 1996. Fire and climate history in the Central Yenisey Region, Siberia. pages 90-104, In J. G. Goldammer and V. V. Furyaev, eds., Fire in Ecosystems of Boreal Eurasia. Kluwer Academic Publishers, London.

8. Goldammer, J. G. and **Swetnam, T. W.** (listed alphabetically with 8 other authors). 1996. Fire in ecosystems of Boreal Eurasia: The Bor Island Fire Experiment Fire Research Campaign: Asia-North (FIRESCAN). Chapter 81, pages 848-873, In J. S. Levine, Biomass Burning and Global Change, Vol. 2. The MIT Press, Cambridge, Massachusetts.

9. Allen, C. D., J. L. Betancourt, and **T. W. Swetnam.** 1998. Landscape Changes in the Southwestern United States: Techniques, Long-term Data Sets, and Trends. Pages 71-84, In T. Sisk, editor, Perspectives on the Land Use History of North America: A Context for Understanding our Changing Environment. U.S. Geological Survey, Biological Science Report USGS/BRD/BSR-1998-0003. 104 pp.

10. Kipfmueller, K. F. and **T. W. Swetnam.** 2001. Using dendrochronology to reconstruct the history of ecosystems. Chapter 8, pages 199-228, In D. Egan and E. A. Howell eds., Techniques for Discovering Historic Ecosystems. Island Press, Washington.

11. **Swetnam, T. W.**, C. H. Baisan, and J. M. Kaib. 2001. Forest fire histories in the sky islands of La Frontera. Chapter 7, pages 95-119, In G. L. Webster and C. J. Bahre eds., Changing Plant Life of La Frontera: Observations on Vegetation in the United States/Mexico Borderlands. University of New Mexico Press, Albuquerque.

12. **Swetnam, T. W**. and C. H. Baisan. 2003. Tree-ring reconstructions of fire and climate history in the Sierra Nevada and Southwestern United States. pages 158-195, In: T. T. Veblen, W. Baker, G. Montenegro, and T. W. Swetnam, editors. Fire and Climatic Change in Temperate Ecosystems of the Western Americas. Ecological Studies Vol. 160. Springer, New York.

13. Milne, B. T., D. I. Moore, J. L. Betancourt, J. A. Parks, **T. W. Swetnam**, R. R. Parmenter, and W. T. Pockman. 2003. Multidecadal drought cycles in south-central New Mexico: Patterns and consequences. In: Climate Variability and Ecosystem Response at Long Term Ecological Research (LTER) Sites, Eds., D. Greenland, D. Goodin, and R. Smith. Oxford University Press, New York.

14. Morehouse, B., G. Christopherson, M. Crimmins, B. Orr, J. Overpeck, **T. Swetnam** and S. Yool. 2006. Modeling Interactions Among Wildland Fire, Climate and Society in the Context of Climatic Variability and Change in the Southwest US. pages 58-78, In: Regional Climate Change and Variability, Impacts and Responses, M. Ruth, K. Donaghy, P. Kirshen. Edward Elgar, Cheltenham, UK.

15. **Swetnam, T. W**., C. H. Baisan, H. D. Grissino-Mayer. In press. Tree-Ring Perspectives on Fire Regimes and Forest Dynamics, To be published in Mount Graham Red Squirrel Symposium Proceedings, University of Arizona Press, Tucson,

Refereed Articles:

16. Madany, M. H., **T. W. Swetnam**, and N. West. 1982. Comparison of two approaches for determining fire dates from tree scars. Forest Science 28(4):856-861.

17. **Swetnam, T. W.** 1983. Gila fire history suggests restoration may require planned ignitions. Restoration and Management Notes 1(4):286.

18. **Swetnam, T. W.**, E. K. Sutherland, and M. A. Thompson. 1983. Comment on dating forest disturbances. Quaternary Research 19:400-401.

19. **Swetnam, T. W**. 1984. Peeled ponderosa pine trees: A record of inner bark utilization by Native Americans. Journal of Ethnobiology 4(2):177-190.

20. Dieterich, J. H., and **T. W. Swetnam.** 1984. Dendrochronology of a fire scarred ponderosa pine. Forest Science 30(1):238-247.

21. **Swetnam, T. W.**, M. A. Thompson, and E. K. Sutherland. 1985. Using dendrochronology to measure radial growth of defoliated trees. USDA Forest Service, Agriculture Handbook 639. 39 p.

22. Biondi, F., and **T. W. Swetnam**. 1988. Box-Jenkins models of forest interior tree-ring chronologies. Tree-Ring Bulletin 47:71-96

23. **Swetnam, T. W.**, A. M. Lynch. 1989. A Tree-Ring reconstruction of western spruce budworm outbreaks in the Southern Rocky Mountains. Forest Science 35(4):962-986.

24. Fritts, H. C., and **T. W. Swetnam.** 1989. Dendroecology: A tool for evaluating variations in past and present forest environments. Advances in Ecological Research Vol. 19:111-189.

25. **Swetnam, T. W.**, and J. L. Betancourt. 1990. Fire-Southern Oscillation relations in the Southwestern United States. Science 249:1017-1020.

26. Van Pelt, N. S., and **T. W. Swetnam.** 1990. Conservation and stewardship of tree-ring study resources: Subfossil wood and living trees. Natural Areas Journal 10(1):19-27.

27. Baisan, C. H., and **T. W. Swetnam.** 1990. Fire history on a desert mountain range: Rincon Mountain Wilderness, USA. Canadian Journal of Forest Research 20:1559-1569.

28. Savage, M., and **T. W. Swetnam.** 1990. Early and persistent fire decline in a Navajo ponderosa pine forest. Ecology 70(6):2374-2378.

29. Brown, P. M., M. K. Hughes, C. H. Baisan, **T. W. Swetnam**, and A.C. Caprio. 1992. Giant sequoia ring-width chronologies from the central Sierra Nevada, California. Tree-Ring Bulletin 52:1-14.

30. Huante, P., E. Rincon, and **T. W. Swetnam.** 1993. Dendrochronology of Abies religiosa in Michoacan, Mexico. Tree-Ring Bulletin 50:15-28.

31. **Swetnam, T. W.**, and A. M. Lynch. 1993. Multi-century, regional-scale patterns of western spruce budworm history. Ecological Monographs 63(4):399-424).

32. **Swetnam, T. W.** 1993. Fire history and climate change in giant sequoia groves. Science. 262:885-889.

33. Brown, P. M., and **T. W. Swetnam.** 1994. A crossdated fire history in a coast redwood forest near Redwood National Park, California. Canadian Journal of Forest Research 24:21-31.

34. Goldammer, J. G. and **Swetnam, T. W.** (listed alphabetically with 26 other authors). 1994. Fire in the boreal ecosystems of Eurasia: First results of the Bor Forest Island Fire Experiment, Fire Research Campaign Asia-North (FIRESCAN). World Resources Review 6(4):499-523.

35. Allen, C. D., R. Touchan, and **T. W. Swetnam.** 1995. A landscape-scale fire history study supports fire management actions at Bandelier National Monument. Park Science Summer 1995, pages 18-19.

36. **Swetnam, T. W.**, B. E. Wickman, H. G. Paul, and C. H. Baisan. 1995. Historical patterns of western spruce budworm and Douglas-fir tussock moth outbreaks in the Northern Blue Mountains, Oregon since A.D. 1700. Research Paper PNW-RP-484. Portland, OR: U. S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.

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38. Gottfried, G. J., **T. W. Swetnam**, C. D. Allen, J. L. Betancourt, and A. L. Chung-McCoubrey. 1995. Chapter 6, Pinyon-juniper woodlands, pages 95 to 132, In D. M. Finch and J. A. Tainter, tech. eds., Ecology, Diversity, and Sustainability of the Middle Rio Grande Basin. General Technical Report RM-GTR-268. U. S. Department of Agriculture Forest Service, Rocky Mountain Forest and Range Experiment Station. 186 p.

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47. Markgraf, V., and **T. W. Swetnam** (listed alphabetically with 7 other authors). 2000. Paleoclimate reconstruction along the Pole-Equator-Pole transect of the Americas. Quaternary Sciences Reviews 19:125-140.

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49. Kitzberger, T., **T. W. Swetnam**, and T. T. Veblen. 2001. Inter-hemispheric synchrony of forest fires and the El Nino-Southern Oscillation. Global Ecology and Biogeography 10 (3): 315-326.

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53. Rollins, M., **T. W. Swetnam** and P. Morgan. 2001. Evaluating a century of fire patterns in two Rocky Mountain wilderness areas using digital fire atlases. Canadian Journal of Forest Research 31(12): 2107-2123.

54. Allen, C. D., M. Savage, D. A. Falk, K. F. Suckling, **T. W. Swetnam**, T. Schulke, P. B. Stacey, P. Morgan, M. Hoffman, and J. Klingel. 2002. Ecological restoration of southwestern ponderosa pine ecosystems: a broad perspective. Ecological Applications 12(5):1418-1433.

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Proceedings Papers:

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72. Lynch, A. M., and **T. W. Swetnam.** 1992. Old-growth mixed conifer and western spruce budworm in the Southern Rocky Mountains. In: M. R. Kauffman, W. H. Moir, and R. L. Bassett, tech. coords., Old Growth Forests in the Southwest an Rocky Mountain Regions, Proceedings of a Workshop, March 9-13, 1992, Portal, Arizona. USDA Forest Service General Technical Report RM-213:66-80.

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75. Caprio, A. C., and **T. W. Swetnam.** 1995. Historic fire regimes along an elevational gradient on the west slope of the Sierra Nevada, California. In: J. K. Brown, R. W. Mutch, C. W. Spoon, and R. H. Wakimoto, tech. coords., Proceedings: Symposium on Fire in Wilderness and Park Management, Missoula, MT, March 30-April 1, 1993,. USDA Forest Service General Technical Report INT-320:173-179.

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78. Mutch, L., and **T. W. Swetnam.** 1995. Effects of fire severity and climate on ring-width growth of giant sequoia after burning. In: J. K. Brown, R. W. Mutch, C. W. Spoon, and R. H. Wakimoto, tech.

coords., Proceedings: Symposium on Fire in Wilderness and Park Management, Missoula, MT, March 30-April 1, 1993,. USDA Forest Service General Technical Report INT-320:241-246.

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81. Seklecki, T. M., H. D. Grissino-Mayer, and **T. W. Swetnam.** 1996. Fire history and the possible role of Apache-set fires in the Chiricahua Mountains of Southeastern Arizona. In P. F. Ffolliott et al. tech. coords., Effects of fire on Madrean Province Ecosystems, A symposium proceedings, USDA Forest Service General Technical Report RM-GTR-289:238-246.

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85. Wickman, B. E. and **T. W. Swetnam**. 1997. Interactions of fire and defoliating insects in western forests: some multi-century patterns. In Diverse forests, abundant opportunities, and evolving realities, Proceedings of the 1996 Society of American Foresters Convention, Albuquerque, NM November 9-13, 1996. Society of American Foresters, Bethesda, MD. P. 222-227.

86. Rollins, M. and **T. W. Swetnam**, and P. Morgan. 2000. Twentieth century fire patterns in the Gila/Aldo Leopold Wilderness Complex New Mexico and the Selway-Bitterroot Wilderness Area Idaho/Montana. In Cole, D. N., S. McCool, W. T. Borrie, and J. O'Laughlin, compilers. Wilderness science in a time of change conference -- Volume 5: Wilderness ecosystems, threats, and management; 1999 May 23-27; Missoula, MT. Proceedings RMRS-P-0-VOL5. Ogden, UT: USDA, Forest Service, Rocky Mountain Research Station.

87. Kipfmueller, K.F. and **T. W. Swetnam.** 2000. Fire-climate interactions in the Selway-Bitterroot Wilderness Area. In Cole, D. N., S. McCool, W. T. Borrie, and J. O'Laughlin, compilers. Wilderness science in a time of change conference -- Volume 5: Wilderness ecosystems, threats, and

management; 1999 May 23-27; Missoula, MT. Proceedings RMRS-P-0-VOL5. Ogden, UT: USDA, Forest Service, Rocky Mountain Research Station.

88. Falk, D. A. and **T. W. Swetnam.** 2002. Scaling rules and probability models for surface fire regimes in ponderosa pine forests. pages 301-318, In: Omi, Philip N.; Joyce, Linda A., technical editors. Fire, fuel treatments, and ecological restoration: Conference proceedings; 2002 16-18 April; Fort Collins, CO. Proceedings RMRS-P-29. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 475 p.

89. **Swetnam, T. W.** 2005. Fire histories from pine-dominant forests in the Madrean Archipelago. Pages 35-43, In: Connecting mountain islands and desert seas: biodiversity and management of the Madrean Archipelago II. Gottfried, Gerald J.; Gebow, Brooke S.; Eskew, Lane G.; and Edminster, Carleton B., compilers. 2004 May 11-15; Tucson, AZ. Proceedings RMRS-P-36. Fort Collins, CO: U.S.

Other Publications:

- **Swetnam, T. W.** 1988. Forest fire primeval. The World and I 3:236-241.
- Parsons, D. J., **T. W. Swetnam**, and N. L. Christensen, Jr. 1999. Introduction to Invited Feature on Historical Variability Concepts in Managing Ecosystems. Ecological Applications 9(4):1177-1178.
- **Swetnam, T. W.** 2002. Fire and climate history in the western Americas from tree rings. PAGES News, 10(1) April 2002.
- Betancourt, J.L., **T. W. Swetnam**, C. Allen, and M. Savage. 2003. Fire in the West: It's no Simple Story, Op-Ed in High Country News, July 7, 2003.
- **Swetnam, T. W.** 2003. Living with Fire. Op-Ed published in the *Arizona Daily Star*, and *Arizona Republic*, Sunday August 10, 2003.
- Barrett, S. W., **T. W. Swetnam**, and W. L. Baker. 2005. Indian fire use: deflating the legend. Fire Management Today 65(3): 31-33.
- **Swetnam, T. W**. and K. Flessa. 2005. The US needs the best science, not political intimidation of scientists. Guest column in *Arizona Daily Star*, Sunday July 23, 2005.

SCHOLARLY PRESENTATIONS (all invited, since 1999):

- Presentation at Sevilleta LTER Symposium, Socorro, New Mexico, January 12-14, 1999.
- Seminar presented in Ecology & Evolutionary Biology Department, UA (for joint appointment), May 5, 1999.
- Presentation at Wilderness Science Conference, Missoula, Montana, May 24-25, 1999.
- Presentation at invited symposium at Ecological Society of America meeting Spokane, WA, August 7-12, 1999.
- Participation in and presentation at Aspen Global Change Workshop on Ecological and Agricultural Impacts of Climate Change, Aspen, CO, August 13-21, 1999.
- Presentation on fire history in SE Arizona to Malpais Borderlands ranchers group, annual science workshop, Douglas, Arizona, January 13, 2000.
- Presented the "Weaver Lecture" at Auburn University, School of Forestry, Auburn, Alabama, January 20, 2000.
- Presented seminar on fire history and fire ecology in western United States at Jones Research Center, Alabama, January 21, 2000.
- Lecture presented to Continuing Education in Ecosystem Management course at Northern Arizona University School of Forestry, February 3, 2000.
- Presentation to CLIMAS group at ISPE, on fire and climate in the SW, February 11, 2000.

- Organized and hosted a workshop (with Barbara Morehouse and Jonathan Overpeck) on "Fire and Climate 2000" for approximately 50 scientists and land managers from throughout western US and Florida, held at ISPE, February 23-24, 2000.
- Presentation to faculty and students of School of Renewable Natural Resources on the Tree-Ring Lab and current research, teaching and outreach efforts, February 29, 2000.
- Attendance and presentation at International Tree-Ring Conference, Mendoza, Argentina, March 31-April 9, 2000.
- Seminar presentation at University of California, Davis on fire history and climate, April 19, 2000.
- Attended Ecological Society of America meeting in Snowbird, UT, co-author of symposium paper, August 3 to 8th 2000.
- Lecture on forest fires and forest restoration to Environmental Law class, Arizona State University Law School, November 13, 2000.
- Presentation on fire and climate variability to annual meeting of Southwestern Fire and Fuels Managers, Flagstaff, Arizona. November 14, 2000.
- Organized and moderated a symposium, and presented a paper, on fire history at first annual National Conference on Wildland Fire, San Diego, CA. November 27-30, 2000.
- Presented a lecture/seminar at Stanford University, on Forest Fires and Climate in Western US, February 9, 2000.
- Attended and presented a talk at National Research Council meeting on Abrupt Climate Change Impacts Meeting, Washington, DC, March 21-23, 2000.
- Organized and hosted a workshop (2nd year, with Barbara Morehouse, Gregg Garfin and Tim Brown) on "Fire and Climate 2001" for approximately 70 scientists and fire managers from throughout western US, held at ISPE, February 14-16, 2001.
- Co-hosted and presented a talk at one-day "Fire-Climate in the Southwest" meeting, UA campus, March 28, 2001.
- Presented a seminar on "Fire and Climate in the Southwest" at Los Alamos National Laboratory, April 19, 2001.
- Attended Eurodendro Meeting in Slovenia, and moderated an oral paper session, June 6-9, 2001.
- Attended Highest II Meeting in Davos, Switzerland, and presented a talk on "Decadal-Scale Climate and Ecological Changes in Southwestern US Mountains", June 25-28, 2001.
- Attended Davos Tree-Ring Conference (in honor of Fritz Schweingruber), and participated on a panel discussion, September 24-26, 2001.
- Presented a lecture/seminar at University of California, Berkeley, Wildfire Seminar Series, November 1-2, 2001.
- Organized and directed "Fire in the West" workshop in collaboration with CLIMAS, Tucson, AZ, March 5-6, 2002
- Organized, hosted, and presented at Paleofire History Workshop for about 70 participants from North and South America, March 23-28, 2002, Tucson, AZ
- Presented an invited after-dinner lecture at 6th International Dendrochronology Conference, Quebec City, Canada, August 27, 2002.
- Presented Invited talk at Sky Island Islands conference on fire in the Southwest, Tucson, AZ, October 19, 2002.
- Presented invited lecture/seminar at Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY, October 25, 2002.
- Keynote talk at Fire & Society workshop, sponsored by Institute for the Study of Planet Earth, Tucson, AZ January 11, 2003.
- Presented invited lecture at "Ecological Integration Symposium", Texas A & M University, College Station Texas, February 22, 2003 (half day, plenary symposium at George H. W. Bush Library, with 4 other senior ecologists from US)

- Presented a talk and participated in workshop on 'Sierra Nevada Science" at Three Rivers, CA, sponsored by USGS, March 14-16, 2003.
- Presented invited plenary talk at MTNCLIM/CIRMOUNT meeting, Lake Tahoe, NV, May 24-28, 2003.
- Invited talk at Fire, Forest Health & Biodiversity Symposium, Denver, CO, June 4-5, 2003 (2-day symposium with leading fire & forest ecologists from US)
- Invited talk at 2003 Xeriscape Conference, Albuquerque, NM, October 17, 2003.
- Presented talks at Annual Malpais Borderlands Science Symposium, Gadsden Hotel, Tombstone, AZ, first week of January, 2004 & 2004.
- Presented invited talk at Climate Change Impacts on Forest Ecosystems Symposium, Sedona, AZ, February 10, 2004.
- Invited plenary talk at Madrean Archipelago Conference, sponsored by US Forest Service, and others, May 12, 2004.
- Invited plenary talk at Climate Variability & Impacts Workshop, Sedona, AZ, sponsored by UA, US Forest Service, and others, January 7-9, 2005.
- Presentation at symposium on Dendrochronology at the American Association for the Advancement of Science, Southwestern and Rocky Mountain Division 80th Annual Meeting, Tucson, AZ, April 13-16, 2005 (I also organized this symposium, which featured several speakers from LTRR). Abstract prepared and included in program.
- Invited departmental seminar, University of Minnesota, Geography, April 15, 2005.
- Talk at Fire History & Climate Synthesis Workshop, Flagstaff, AZ May 2-6, 2005. Approximately 40 attendees. I was a primary organizer of this meeting (with Scott Anderson, NAU) See abstracts at http://www4.nau.edu/firehistory/
- Organized, attended and presented a session at Annual Ecological Society of America meeting, on crown fires and plant succession, Montreal Canada, August, 2005.
- Attended Climate Change Science Program Workshop, and presented a poster (on WALTER fire project) Arlington, VA, November 14-15, 2005.
- Invited plenary talk on fire climatology to USGS Fire Science Symposium, December 5-9, 2005 (I was on the organizing committee for this national conference, and I was a primary leader for a one-day field trip to the Santa Catalina Mtns for 80 participants).
- Departmental seminar presented at Oklahoma State University, April 11, 2006.
- Presentation on climate change and forests at meeting of National Council on Science for Sustainable Forestry, Denver, CO, April 26, 2006
- Departmental seminar at Colorado State University, Fort Collins, CO, April 28, 2006.
- Presented a talk at 7th International Dendrochronology Conference, Beijing China, June 11-17, 2006 (I also chaired the Academic Committee for this conference, and help select key note speakers and organized symposia).
- Presented a talk at biennial American Quaternary Association meeting, Bozemen, MT, August 17, 2006.

SERVICE/OUTREACH (since 1999):

Offices in Professional Organizations:

- Local Host for Ecological Society of America Meeting in Tucson, AZ, 2001
- Program Chair for Ecological Society of America Annual Meetings, 2003-2004
- Editor for Tree-Ring Research, journal of the Tree-Ring Society, 2000; Treasurere of Tree-Ring Society, 2002-present.

Editorial: See "Editorial Boards", page 2. Numerous ad hoc reviews completed for *Science, Nature*, *Ecology, Ecological Applications, Landscape Ecology, Forest Science, Canadian Journal of Forest Research, Proceedings of the National Academy of Sciences, Climatic Change, Bulletin of the American Meteorological Society, Dendrochronologia, and other journals.* Generally do about 5 or 6 ad hoc reviews per year, in addition to the reviews as Associate Editor.

Local/State:

- Invited lecture at Ecosystem Management Short course, Northern Arizona University, School of Forestry, very Feb., 1999-2006.
- Presentation to Rincon Optimists Club, on Climate Change, May 10, 2000.
- Lecture for the Southern Arizona Native Plant Society, Tucson Botanical Gardens, April 19, 2001.
- Presented evening lecture to Sky Island Alliance, University Medical School Auditorium, Tucson, January 8, 2002.
- Presentation at Rincon Optimist's Club, on Tree Rings, August 14, 2002.
- Presentation to Rotary Club, on climate and fire in the western US, Tucson, February 27, 2003.
- Evening lecture to Arizona Geological Society meeting, on tree rings, drought, and fire, Tucson, June 3, 2003.
- Presentation to Rincon Rotary Club, on fires in the Santa Catalinas and the current drought, October 9, 2003.
- Evening lecture to Arizona Hydrological Society, on tree rings, drought and fire, Tucson, December 9, 2003.
- Panel Member for USDA Forest Service review of Aspen Fire circumstances and responses, Radisson Hotel, Tucson, AZ, January 12, 2004.
- Live interview with local TV News, channel 11, regarding upcoming fire season and drought, February 2, 2004.
- Keynote talk on Science and Environmental Change, at Science and Math , High School teachers Conference, Ironwood Elementary School, Tucson, AZ, February 7, 2004 (approx. 100 teachers)
- Invited talk to So. Arizona Chapter of Society of American Foresters, on fire and climate, March 18, 2004.
- Interview with KUAT Arizona Illustrated, Kimberley Kraft, on tree rings and drought, in the Tree-Ring Lab, June 2, 2004.
- Invited presentation on fire and climate to US Fish & Wildlife managers meeting, Tucson, AZ, approximately 100 fire and wildlife managers present, December 9, 2004.
- Traveled with "Desert Speaks" KUAT film crew to California and New Mexico, and filmed tree-ring sites and interviewed on topics of droughts and forest fires. Two, week-long excursions, June 20-24, and September 5-9, 2005.
- Participated on panel review of The Nature Conservancy/US Forest Service Southwest regional fire and restoration modeling collaborative program, and prepared a report, May 2, 2006.

National/International

- Numerous interviews with media (KUAT radio interviews, Arizona Illustrated), Associated Press, New York Times, Arizona Daily Star (many interviews and articles), Lo Que Pasa, Discovery Channel, ABC News, LA Bureau, UA Research Reports, Albuquerque Journal (several interviews and articles), Wildfire magazine, others.
- Presentation of public lecture at Aspen Colorado, (Walter Orr Roberts Lecture) August 18, 1999.
- Film interview with NBC News film crew, on climate variability, January 12, 2000.

- Tour of Tree-Ring Lab for USFS Forest Pest Management directors from western US, March 22, 2000.
- Field Trip leader for Environmental History Conference participants, to Tree-Ring Lab and Santa Catalina Mountains, April 16, 2000.
- Organized and presented (with Dr. Paul Sheppard) a 4-day workshop on "Teaching Dendrochronology in College Courses", National Science Foundation's Chautauqua Program, for about 20 college professors from throughout US, at Tree-Ring Lab, each year, 2000-2002.
- Interviews with Korean film crew, science education program, on tree-ring research and climate change, June 24, 2000.
- Presentation and panel discussion in Santa Fe New Mexico on fire hazard within the Santa Fe Watershed and options for forest restoration, June 28, 2000.
- Invited testimony (with Dr. Penny Morgan, Dr. Leon Neuenschwander of University of Idaho) to US House of Representatives, Committee on Natural Resources, Subcommittee on Fire and Forest Health in Washington DC. June 7th, 2000.
- Invited testimony to US House of Representatives, Committee on Natural Resources, Subcommittee on Fire and Forest Health, field hearing Albuquerque, NM, August 14, 2000.
- Presentation to the US Bureau of Land Management Science Advisory Team, March 6, 2001.
- Briefing to US Senate Natural Resources Committee staff members, on Fire Ecology and Fire Problems in the West, sponsored by the Ecological Society of America, July 23, 2001.
- Presentation on Tree-Rings to Audubon Society, Randall-Davey Center, Santa Fe, NM, October 12, 2001.
- Served as an external reviewer for a promotion and tenure package, University of Hawaii, 2001.
- Presentation to "Fire Learning Network" field trip, Jemez Mountains, NM, sponsored by The Nature Conservancy, April 3, 2002.
- Evening lecture to Valles Caldera National Preserve symposium, hosted by the University of New Mexico, Los Alamos, April 23, 2002.
- Presentation at Randall Davey Audobon Center dedication ceremony, Santa Fe, NM, May 3, 2002.
- Lecture at High Desert Museum, Bend, Oregon, On fire and insect outbreak research in Oregon, June 8, 2002.
- Served as an external reviewer for promotion and tenure package for University of Maine, 2002.
- Organized and hosted meeting of the International Multiproxy Fire History Database Advisory Board, Tucson, AZ, February 7, 2003.
- Helped organize and hosted Joint Fire Sciences Program (JFSP) – Southwest Workshop in Tucson for approx. 60 participants, March 25-27, 2003. (this workshop was designed to help identify research agendas for the $8 million/year national JFSP program)
- Interview on KUAT's Arizona Illustrated, on fires and President's Bush's speech on Mt. Lemmon (which I attended), August 11, 2003.
- Interview by Ted Robbins on a news segment about drought in the western US; this appeared on the national PBS program Lehrer NewsHour, August 15, 2003.
- Attended and gave a short address at the 50th Anniversary of the Discovery of Ancient Bristlecone Pines, and dedication of new visitor's center, at Schulman Grove, Bishop, CA., September 12, 2003.
- Meeting and consultation with investigators (Dr. Chester Joy and colleagues) from General Accounting Office (investigative agency of US Congress) on forest fire management and policy issues in US, Tucson, November 4, 2003.
- Interview with US General Accounting Office investigators on fire management issues in United States (met with Chester Joy and Susan Iott), January 21, 2004.
- Attend Forest Restoration Workshop, and gave a talk, sponsored by Gila National Forest and The Nature Conservancy, Silver City, NM, April 21-22, 2004.

- Invited presentation on climate change and fire to Western Forest Leadership Council; approximately 100 national level fire managers from all agencies and most states in the west; Gov. Napolitano attended, Phoenix, AZ, May 4, 2004.
- Interview with ABC World News (Brian Rooney) on drought, (in Tree-Ring Lab) May 21, 2004.
- Filmed interview with producers for a US Forest Service film on drought, bark beetles and forest health, in Tree-Ring Lab, August 23, 2004.
- I helped organize and attended a meeting sponsored by International Geosphere Biosphere Program, on global fire history and climate, Boulder, Co., November 8-9, 2004.
- Participated in video interview with Korean documentary film maker, in Tree-Ring Lab, July 2, 2005.
- Lecture to S-580 Course, Fire Use Applications, at National Advanced Fire & Resource Institute, Tucson, AZ March 20, 2006 (about 100 senior, national fire managers from US attended)
- Attended Old Growth Fire workshop at Northern Arizona University, participated in white paper preparation, on national issues of restoration and fire in high fire frequency regimes. April 18-19, 2006.

Departmental/College/University

- Preparation of approximately 10 to 20 letters of reference each year for admission to graduate schools, for academic job applications, and other jobs for former students, and others, each year, 1999-present.
- **Library Council member 1996-2000.**
- Graduate College representative at oral preliminary exam (1997-2002).
- Invited speaker at UA Honors Luncheon on Tree-Rings, Fire and El Niño, Jan. 29, 1999.
- LTRR faculty committee for developing recommendations on teaching portfolio and teaching evaluation procedures (with Katie Hirschboeck).
- Lecture to Conservation Biology course (ECOL 406R), October 19, 2000.
- Faculty annual report evaluation committee, 2000.
- Academic Program Review committee work for LTRR, 2000.
- Lecture on SW Ecosystems to GEOS 200, Environmental History of the Southwest, February 10, 2000.
- Presentation in Arid Lands Graduate Seminar (for Chuck Hutchinson), on fire ecology in SW grasslands and woodlands, February 16, 2000.
- Member of proposal and planning committee for Cooperative Ecosystem Studies Unit, US Department of Interior. Collaborative effort with School of Renewable Natural resources and other units on UA Campus. This proposal was successful, and the CESU is currently being organized on campus, 2000.
- Chaired LTRR faculty search committee throughout winter and spring of 2000. Resulted in hiring of Dr. Michael Evans.
- Interview with Noreen Houtz and subsequent assistance, for COS Newsletter article on the Tree-Ring Lab, May 25, 2000.
- Worked on multi-college committee to develop ideas and proposed initiatives for "water" emphasis in UA Campaign. Provided written text for use in describing the importance and focus of water resources and climate change research on campus, with Tree-Ring Lab participation. (This committee chaired by Dean Eugene Sander). September, 2000.
- Preparation of poster and other display materials illustrating Tree-Ring Labs' past and current contributions in research, teaching and outreach for UA Capital Campaign kickoff, University of Arizona, October 6, 2000.

- Served as reviewer and member of promotion and tenure committee in School of Renewable Natural Resources for Dr. David Williams' promotion from Assistant to Associate Professor. October 24, 2000.
- Served on a search committee for the College of Science Director of Development, resulting in hiring of Mr. Bob Logan, 2001.
- Served as reviewer and member of promotion and tenure committee in School of Renewable Natural Resources for Dr. Robert Stiedl's promotion from Assistant to Associate Professor. October 24, 2001
- After- dinner talk on tree rings to University of Arizona Alumni, (President Peter Likens was present), Flagstaff, AZ, August 16, 2002
- Presentation on fire history and climate studies to Associate of Fire Ecologists, UA Student Chapter, November 20, 2002
- After dinner presentation to UA College of Sciences Galileo Circle, Tucson, AZ, November 21, 2002
- Lecture for UA Faculty Community Lecture Series, on Tree Rings, March 6, 2001
- Led a tour of the Tree-Ring Lab for UA faculty group "Heads Up", March 8, 2001.
- Participation in discussions and advice to US Forest Service and Steward Observatory, University of Arizona, on wildfire threats on Mt. Graham, and possible fuels treatments, February 28, 2003.
- Member of University committee on 5-year performance review of College of Agriculture Dean Eugene Sander, 2003-2004.
- Attended numerous meetings with Earth Systems Processes Research Institute, and Environmental and Natural Resources Building II planning team members, one to several meetings per month through 2004 and part of 2005. This included additional meetings with Facilities Design regarding architect selection committee
- Search Committee member for two School of Natural Resource professor positions, January-July, 2006. Two successful hires.
- Lecture on Southwest environmental history and tree rings to John Messina's Sonora Course TRAD 104, Feb 2, 2006
- Served as a speaker on "Sense of Place" field trip for College of Science's Galileo Circle, to Mount Lemmon. October 7, 2006.

RESEARCH GRANTS AND CONTRACTS

- Radial Growth Analysis of Western Spruce Budworm Damage, 1/83 to 1/84, USDA Forest Service, Southwestern Region, $7,600.
- Development of a manuscript describing the field and techniques for assessing effects of western spruce budworm defoliation on radial growth of infested trees, 1/84 to 12/84, USDA Forest Service, Pacific Northwest Forest Experiment Station, $3,000.
- Assessment of Impacts to Tree Radial Growth Caused by Western Spruce Budworm Defoliation, 1/84 to 12/85, USDA Forest Service, Southwestern Region, and Canada-United States Spruce Budworm Research Program, $12,895.
- Radial Growth Assessment of Defoliated Trees in the Colorado Front Range, 5/85 to 8/86, USDA Forest Service, Rocky Mountain Region, $9,582.
- Development of a manuscript on dendroecology, 6/86, Utility Air Regulatory Group, Acid Deposition Committee, Washington, D. C., $4,000. (Co-PI, H. C. Fritts)
- Evaluation of Severity of Spruce Budworm in Mixed Conifer Habitat Types of the Southwest, 8/86 to 9/87, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, $15,000.

- Preliminary Tree -Ring Chronology Development of Redwood National Park, 1/87 to 4/87, USDI National Park Service, Redwood NP, $3,000.
- Dendrochronological Assessment of the Severity of Western Spruce Budworm Outbreaks, USDA Forest Service, Rocky Mountain Forest And Range Experiment Station, 4/87 to 12/88, $27,000. (Ann Lynch)
- Giant Sequoia Fire History: A Feasibility Study, 7/87 to 6/88, USDI National Park Service, Sequoia National Park, $19,711. (Chris Baisan)
- Analysis of Growth Trends and Variations in Conifers in the Southwestern United States, 7/87 to 2/90, Environmental Protection Agency, Western Conifers Research Cooperative, National Acid Precipitation Program. $222,327. (Co-PI, D.A. Graybill)
- Fire History Study of Rhyolite Canyon, Chiricahua National Monument, 9/87 to 9/88, USDI National Park Service, Southern Arizona Group Office, $9,988. (Chris Baisan)
- Tree-Ring Dating of Peeled Ponderosa Pines from Dolores River, Colorado, 11/87 to 3/88, Goodson and Associates, Denver Colorado, $1,000.
- Dating of Fire History Specimens from Bandelier National Monument, 3/88 to 9/88, USDI National Park Service, Bandelier NM, $4,500. (Chris Baisan)
- Tree-Ring Reconstruction of Giant Sequoia Fire Regimes, 7/88 to 12/91, USDI National Park Service, Sequoia, Kings Canyon and Yosemite NPs, $195,260. (Chris Baisan, Tony Caprio, Ramzi Touchan)
- Tree-Ring Dating of Fire Scarred White Bark Pine from Yellowstone, 4/89 to 6/89, University of Idaho, $2,000. (Chris Baisan)
- Tree-Ring Dating of Fire Scarred Coast Redwood Specimens, 8/89 to 9/89, USDI National Park Service, Redwood NP, $4,000. (Peter Brown)
- Tree-Ring Dating of Fire Scarred Ponderosa Pine from Walnut Canyon National Monument, Arizona, 10/89 to 3/90, USDI National Park Service, Southern Arizona Group Office, $2,700. (Chris Baisan)
- Reconstruction of Fire and Flood History in Rhyolite Canyon, Chiricahua National Monument, Arizona, 10/89 to 12/90, Southwest Parks and Monuments Association, $5,048. (Chris Baisan)
- Tree-Ring Investigation to Reconstruct Western Spruce Budworm Outbreak History in the Sacramento Mountains, New Mexico, 5/90 to 6/92, USDA Forest Service, Southwestern Region Office, $9,950. (Ann Lynch)
- Fire History for Northern New Mexico, 9/90 5/91, USDI National Park Service, Bandelier NM and USDA National Forest Service, Santa Fe NF, $38,000. (Ramzi Touchan, Craig Allen)
- Assessment of Phenological Growth Patterns in Conifer Species in Chiricahua National Monument, Arizona, 10/90 to 12/93, Southwest Parks and Mon. Assoc, $16,313. (Co-PI. Chris Baisan)
- A tree-ring history of western spruce budworm and Douglas-fir tussock moth history in the Blue Mountains, Oregon, 11/90 to 06/95, US Forest Service, Pacific Northwest Research Station, $42,000. (Boyd Wickman, Chris Baisan)
- Dendroecological Research on Mt. Graham, 5/91 to 2/92, USDA Forest Service, $4,048. (Co-PI, H. Grissino-Mayer)
- Fire history and climatology in the southern and central Sierra Nevada, 6/91 to 5/97, National Park Service, Global Change Program, $302,887. (Chris Baisan, Kiyomi Morino)
- Dendrochronology and Paleoenvironmental Research of El Malpais National Monument, 6/91 to 6/94, USDI National Park Service, El Malpais NM, $38,677. (Co-PI, H. Grissino-Mayer)
- Organ Mountain Fire History, 12/91 to 6/94, State of New Mexico, Natural Heritage Program, and The Nature Conservancy, $39,891. (Kiyomi Morino)

- Radial Growth Response of Giant Sequoia to High Intensity Fire, 1/92 to 12/93, State of California, Department of Forestry, $13,284. (Tony Caprio, Linda Mutch, Chris Baisan)
- Fire history of Desert-Island Mountain Ranges in the Mexican Borderlands Region, 3/92 to 12/94, The Nature Conservancy, $56,276. (Chris Baisan)
- Long-term Dynamics of Whitebark Pine in the Sawtooth Wilderness, Idaho. 5/92 to 6/96. USDA Forest Service, Intermountain Forest Experiment Station. $41,000. (Dana Perkins)
- The influence of Fire-Climate Interactions on the Growth of Giant Sequoias, 6/92 to 12/93, USDI National Park Service, Interagency Fire Center, $31,416. (Linda Mutch).
- Sandia and Manzano Mountain Fire History, 9/92 to 9/95, USDA Forest Service, Cibola NF, $25,000. (Co-PI, Chris Baisan)
- Climatic variation in the Sonoran desert from instrumental climate data and tree rings, 3/93 to 3/98, National Biological Service and National Park Service, $215,000. (Co-PI, David Meko, Chris Baisan)
- Fire History of the Calaveras Giant Sequoia Groves, State of California, State Parks Department, 7/93 to 12/98, $65,000. (Chris Baisan)
- Dendrochronology/Paleoenvironmental research at Bandelier National Monument, 7/93 to 6/94, National Park Service, $7,400. (Craig Allen, Chris Baisan)
- Paleofire and climate history in Siberia, 7/93 to 12/94, National Science Foundation, $15,000.
- Role of climate in masting, recruitment and mortality of pinyon pine, 6/94 to 6/96, US Forest Service, Rocky Mountain Research Station, $48,500. (J. L. Betancourt, G. Gottfried)
- A millennial length reconstruction of climate for the middle Rio Grande Basin from tree rings, 6/94 to 5/98, US Forest Service, Rocky Mountain Research Station, $20,000. (Co-PI, enri Grissino-Mayer, Chris Baisan)
- The long-term role of wildfire and spruce bark beetle outbreaks in forest dynamics at the Kenai National Wildlife Refuge, Alaska, 7/94 to 5/97, US Fish & Wildlife Service, $69,720. (Co-PI, Chris L. Fastie)
- Mapping past and potential fire regimes in Rocky Mountain wilderness landscapes, 8/94 to 5/98, US Forest Service, Aldo Leopold Research Institute, $76,609 (Penny Morgan, Matt Rollins)
- Regional dendroecology research, 9/94 to 9/99, US Forest Service, Rocky Mountain Research Station, $217,810. (Chris Baisan, Kiyomi Morino, Rena Ann Abolt, Margot Wilkinson, Shelly Danzer, Dan Ryerson)
- Fire regime reconstruction in the Southwestern borderlands, 9/94 to 8/97, US Forest Service, Rocky Mountain Research Station, $78,849. (Mark Kaib, Chris Baisan)
- Development of dendroclimatic reconstructions, 2/95 to 2/95, Department of Defense and US Geological Survey, $9,028. (Co-PI, Henri Grissino-Mayer)
- Develop tree-ring chronologies from the areas of west Texas, northern Mexico, and southern New Mexico, 7/95 to 2/96, Department of Defense and US Geological Survey, $46,840. (Co-PI, Henri Grissino-Mayer)
- Expanded fire regime studies in the Jemez Mountains, New Mexico, 8/95 to 1/97, National Biological Service, $35,692. (Craig Allen, Chris Baisan, Kiyomi Morino)
- A tree-ring reconstruction of pandora moth population history in central and southern Oregon, 9/95 to 12/97, US Forest Service, Pacific Northwest Research Station, $45,800. (Jim Speer, Malcolm Hughes, Gregg Garfin, Andy Youngblood, Chris Baisan)
- Expanded fire history in Chiricahua National Monument, 8/96 to 12/98, National Park Service, Southern Arizona Group Office, $29,000. (Co-PI, Chris Baisan, Shelly Danzer)
- Fire regime assessment for Coronado National Memorial, 8/96 to 12/98, National Park Service, Southern Arizona Group Office, $12,500. (Chris Baisan, Kiyomi Morino)

- Climate-fire ecosystem linkages on decadal to centennial time scales in the northern Rockies, 8/97 to 7/00, National Science Foundation, Geography and Atmospheric Dynamics Programs, $196,463. (Kurt Kipfmueller, Matt Rollins, and in collaboration with Penny Morgan at Univ. of Idaho & Cathy Whitlock at Univ. of Oregon, who have separate awards)
- Fire effects on Huachuca mountain mixed-conifer forests and associated species of concern, 7/98 to 10/98, The Nature Conservancy, (Co-PI, Kiyomi Morino), $4,300.
- Climate change and the stability of sky-island conifer populations in the Sonoran desert, 8/98 to 12/99, US Geological Survey, Biological Resources Division, Global Change program (Co-PI, Dave Meko, June Kirkby, Chris Baisan), $19,944.
- Fire History Inventories to Assist Administration Planning for the Tonto National Forest, Central Arizona, 8/98-8/03, $40,000, Tonto National Forest, US Forest Service, PI: Thomas Swetnam (Mark Kaib graduate student)
- Crown fire histories, bog fire scar histories and drought-induced ecotone shifts, 4/99-12/04, $245,621, US Geological Survey, National Biological Service, and Global Change Program. PI's: Thomas Swetnam and Chris Baisan (collaborations with Dr. Craig Allen and Dr. Scott Anderson)
- Sierra Nevada forest dynamics, 5/99 to 4/04, $165,056, US Geological Survey, National Biological Service, Global Change Program. PI's Thomas Swetnam and Chris Baisan
- Fire history and restoration research in Monument Canyon Research Natural Area, 7/99-3/30/03, $111,332, Santa Fe National Forest, US Forest Service, Joint Fire Sciences Program. Co-PI's Thomas Swetnam and Don Falk
- Pinyon Juniper woodland fire history studies in southern New Mexico, 10/99-12/03, $25,200, Department of Defense and the University of New Mexico. PI: Thomas Swetnam
- Tree-Ring assessment of tent caterpillar outbreaks in aspen stands on northern New Mexico, 9/00-4/1/03, $5,970, US Forest Service, Rocky Mountain Research Station. PI's Thomas Swetnam and Chris Baisan (collaborations with Ann Lynch, Ignacio Garcia-Gonzales)
- Climatic and Human Impacts on Fire Regimes in Forests and Grasslands of the U.S. Southwest: Assessing the Consequences of Interactions between Human Activities and a Changing Climate, 11/00 to 10/03, $1,260,993, FY 2000 Science to Achieve Results (STAR) Program, National Center for Environmental Research, Environmental Protection Agency (Barbara Morehouse PI, Co-PIs: Thomas Swetnam, Jonathan Overpeck, Steve Yool, Barron Orr, Gary Christopherson)
- The Monument Canyon Restoration Program: Reducing extreme fire risk & conducting research in an old-growth New Mexico Ponderosa pine forest, 10/01-9/05, $344,824, USDA Forest Service, Collaborative Forest Restoration Program, Co-PI's Thomas Swetnam and Don Falk.
- Landscape Fire History Patterns in the Sky Islands of Southeastern Arizona, 3/13/02-12/31/2004, $79,421, Rocky Mountain Research Station, US Forest Service. PI: Thomas Swetnam (Jose Iniquez graduate student)
- Dissertation Research: Ecological effects of temporal and spatial variability in the disturbance regime of an old-growth Ponderosa Pine Forest, With Don Falk, 6/1/02-5/31/03, $5,108, Ecological Studies Program, NSF, Co-PI's: Don Falk and Thomas Swetnam
- ESA Program Chair Assistant and Expenses, 12/1/02-11/30/0, $59,000, Ecological Society of America, PI; Thomas Swetnam
- Paleofire History Workshop, Mar 23-28, 2002 - combined funding requested and received from NSF (International Programs), NOAA (Office of Global Programs), US Forest Service (Pac. NW Research Station), and PAGES (inter-American Institute), and Joint Fire Sciences Program, total $55,000.
- A Fire-Climate Synthesis in the Western United States, Western Mountain Initiative, USGS Global Change Program, $48,979, 8/04-12/06

- Comparing Fire scar analysis, fire atlas records and fire simulations in the Saguaro-Rincon Mountains Wilderness, Aldo Leopold Wilderness Research Institute, US Forest Service, $91,961, 09/01-12/05
- FSML: Promoting Biological Research on the Colorado Plateau with the Merriam-Powell Research Station: National Science Foundation DBI-0224851, (Co-PIs Michael Wagner; James Collins, Stanley Smith), $249,010 (all funds go to NAU), 9/02-8/05
- Extension to the International Multiproxy Paleofire Database, USDA Forest Service, $3,000, 9/04-9/06
- Variability, Social Vulnerability and Public Policy in the Southwestern US -- Phase 2 (also known as the Climate Assessment for the Southwest), (PI: Jonathan Overpeck; Swetnam is one of nine co-PIs), NOAA Office of Global Programs Grant # NA16GP2578, $4,452,000, 6/02-05/07
- Multi-century reconstruction of chaparral fire history using fire-scarred bigcone Douglas-fir in three southern California National Forests. (PI: T.W. Swetnam; Co-PIs Keith Lombardo, Chris Baisan, and Mark Borchert), USDA Forest Service, Interagency Joint Fire Science Program, $130,000, 10/06-09/09.
- Fire regimes of montane grasslands of the Valles Caldera National Preserve, New Mexico. (PI: Don Falk, Co-PIs T.W. Swetnam, Craig Allen and Bob Parmenter), USDA Forest Service, Interagency Joint Fire Science Program, $256,929, 11/06-09/09.

RAMZI TOUCHAN

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CHRONOLOGY OF EDUCATION

1991	Ph.D.	Watershed Management	The University of Arizona
1986	M.Sc.	Watershed Management	The University of Arizona
1977	B.Sc.	Agriculture Engineering	University of Aleppo

MAJOR RESEARCH & TEACHING FIELDS

Dendroclimatology -- with emphasis on dendroclimatology of the Middle East and North Africa and the link between atmospheric circulation processes and tree-growth patterns.
Watershed Management—Application of dendrochronology in natural resource management

EMPLOYMENT

2004-to present Associate Research Professor, Laboratory of Tree-Ring Research, The University of Arizona, Tucson, Arizona.
A Joint Associate Professor, School of Natural Resources, The University of Arizona, Tucson, Arizona.
1997-2004 Research Specialist Senior, Laboratory of Tree-Ring Research, The University of Arizona, Tucson, Arizona.
1993-97 Research Specialist, Laboratory of Tree-Ring Research, The University of Arizona, Tucson, Arizona.
1991-93 Postdoctoral Fellow, Laboratory of Tree-Ring Research, The University of Arizona.
1987-91 Graduate Student Assistant, Laboratory of Tree-Ring Research, The University of Arizona, Tucson, Arizona.
1983-84 Research Assistant, Department of Forestry, University of Aleppo, Aleppo, Syria.
1977-83 Technical Manager, Union of Syrian Agriculture, Aleppo, Syria.

HONORS AND AWARDS

Minister of Agriculture in Jordan, the highest medal of honor for research and for conducting training courses, 1999.

PUBLICATIONS

Referred Chapters in a Book

Luterbacher, J., and 48 coauthors, Mediterranean climate variability over the last centuries: A review, in: The Mediterranean Climate: an overview of the main characteristics and issues, Eds. Lionello, P., Malanotte-Rizzoli, P., and Boscolo, R., Elsevier, Amsterdam, the Netherlands, 27-148, (2005).

Refereed Journal Articles

Touchan, R.; Funkhouser, G.; Hughes M.K.; Erkan, N. Standardized precipitation index reconstructed from Turkish tree-ring widths. *Climatic Change*, 72 (3):339-353 (2005).

Touchan, R., Xoplaki, E., Funkhouser, G., Luterbacher, J., Hughes, M.K., Erkan, N., Akkemik, Ü., and Stephan, J., Reconstructions of Spring/Summer Precipitation for the Eastern Mediterranean from Tree-Ring Widths and its Connection to Large-Scale Atmospheric Circulation , *Climate Dynamics*, 25:75-98 (2005).

Touchan, R.; Garfin, G.M.; Meko, D.M.; Funkhouser, G.; Erkan, N.; Hughes M.K.; Wallin, B.S. Preliminary reconstructions of spring precipitation in southwestern turkey from tree-ring width. *International Journal of Climatology*, 23:157-171 (2003).

Touchan, R. and Hughes, M.K. The role of dendrochronology in natural resource management. USDA Forest Service Proceedings RMRS-P-13:277-281 (2000).

Diaz C. S, **Touchan, R**., and Swetnam, T.W. A tree-ring reconstruction of past precipitation for Baja California Sur, Mexico. *International Journal of Climatology* 21:1007-1019 (2001).

Touchan, R., Meko, D.M., and Hughes, M.K. A 396-year reconstruction of precipitation in southern Jordan. *Journal of the American Water Resources Association* 35 (1): 45-55 (1999).

Touchan, R. and Hughes, M.K. Dendrochronology in Jordan. *Journal of Arid Environments* 42:291-303 (1999).

Touchan, R., and Ffolliott , P. Thinning of Emory oak coppice: Effects on growth, yield, harvesting cycle. *The Southwestern Naturalist* 44(1):1-5 (1999).

Hughes, M.K., Vaganov, E.A., Shiyatov, S.A., **Touchan, R**., and Funkhouser,G. Twentieth-century summer warmth in northern Yakutia in a 600-year context. *Holocene* 9:603-608 (1999).

Hughes, M. K., **Touchan, R**., and Brown, P.M. A multimillennial network of giant sequoia chronologies for dendroclimatology. *In Tree Rings, Environment and Humanity* Editors, J.S. Dean, D. M. Meko, and T.W. Swetnam. RADIOCARBON pp225-234 (1996).

Touchan, R., Allen, C., and Swetnam, T. W. Fire history and climatic patterns in ponderosa pine and mixed-conifer forests of the Jemez Mountains, Northern New Mexico. *In Proceedings, Symposium on La Mesa Fire.* USDA Forest Service, Rocky Mountain Forest and Range Experiment Station General Technical Report 286: 33-46 (1996).

Touchan, R.; Swetnam, T.W.; and Grissino-Mayer, H.D. Effects of livestock grazing on pre-settlement fire regimes in the Jemez Mountains of northern New Mexico. *In Proceedings: Symposium on Fire in Wilderness and Park Management: Past Lessons and Future Opportunities.* USDA Forest Service, Intermountain Forest and Range Experiment Station General Technical Report 320: 268-272 (1995).

SCHOLARLY PRESENTATIONS

(selected invited presentations during last 6 years listed)

Invited speaker to the International Workshop of the EU-Concerted Action of AVEC (Vulnerability of European ecosystems facing increasing drought risk). Doryssa Bay, Pythagorion, Samos Greece, 10-12 April 2003.

Invited speaker to Second International Conference Science and Technology in Archaeology and Conservation. Amman, Jordan. December 7-11, 2003

Invited speaker to ***Third International Conference Science and Technology in Archaeology and***

Conservation. Amman, Jordan. December 7-11, 2004.

Invited speaker to The Second Water Reuse Conference Amman, Jordan. June 6-9, 2005

National and International Conference presentations

Role of Dendrohydrology in Collaborative Planning for Water Sustainability in the Middle East, the Mediterranean, and North Africa. The 7th International Conference on Dendrochronology (Cultural Diversity, Environmental Variability) Beijing, China 11-17 June, 2006.

Dendroclimatology in the Near East**.** Tree Rings and Climate: Sharpening the Focus, Tucson, Arizona, April 6-9, 2004.

Dendroclimatology of Turkey. Sixth International Conference on Dendrochronology (Dendrochronology, Environmental Change and Human History). Quèbec City, Canada, August 22^{nd}-27^{th}, 2002.

Dendroclimatology in the Near East. The International Conference on Dendrochronology for the Third Millennium. Mendoza, Argentina, April 2-7, 2000.

GRANTS AND CONTRACTS

Climate Variability from North African Tree Rings" PI: Ramzi Touchan. Granting Agency: NSF, Duration: 4 yrs. (2003-2006), Amount: $373,136.

Near East Climate Variability Reconstructed from Tree Rings" PI: Ramzi Touchan. Granting Agency: NSF, Duration: 4 yrs. (2000-2004), Amount: $ 222,603.

European Climate of the Last Millennium 'Millennium" Subcontract: Ramzi Touchan. Granting Agency: EU Sub-Priority 6-Global Change and Ecosystems, Duration: 1-2 yrs. (2006-2008), Amount: 63,288 EUROS.

SERVICE SUMMARY

Ramzi Touchan regularly reviews research proposals for the NOAA Global Change Program and for several scientific journals: Climate Dynamics, Arid Environments, International Journal of Climatology, International Journal of Biometeorology, International Journal of Environment and Pollution, Dendrochronologia, and Methods and Applications of Absolute Chronology "Geochronometria". He serves as a member of the Technical Assistance Team for the Sustainable Development of Drylands Project at the International Arid Land Consortium at the University of Arizona. He was assigned the Chairman of the Scientific Committee for the conference entitled "Can Water Resources be Sustained in Drylands? *Challenges: Present and Future*" that will be held in Amman, Jordan between December 10-12, 2007. He was selected to be a member on the scientific committee for the First MedCLIVAR Workshop on Reconstruction of Past Mediterranean Climate that was held in Carmona, Seville, Spain, 9-11 November, 2006. He was interviewed several times in local and international newspapers and journals discussing drought issues in the Middle East and North Africa. He also carries out extensive outreach and service aimed at communicating his research findings to other scientists, land and resource managers, and policy makers in the Middle East, Eastern Mediterranean, and North Africa. He developed three workshops in the Middle East on the role of dendrochronology in natural and water resources management.

AFFILIATIONS

(a) *Graduate and Post Doctoral Adivosrs*.

M.Sc. & Ph.D	Dr. Peter Ffolliott, The University of Arizona, School of Renewable Natural Resources, Tucson, AZ 85721
Post Doctoral	Dr. Thomas Swetnam, Laboratory of Tree Research, Tucson, Az 85721

(b) *A Committee Member for a Ph.D. Student.*
Nesibe Dağdeviren, Istanbul University, Turkey and Said Attalah, University of Ouargla, Algeria.
Ramzi Touchan is an associate research professor of dendroclimatology at the Laboratory of Tree-Ring Research of the University of Arizona where he is involved in both research and teaching in. He has interdisciplinary ties with the School of Natural Resources, Departments of Watershed Management (Joint Appointment) and a faculty member of the Center for Middle Eastern Studies

Ramzi Touchan's research integrates dendrochronology into natural and water resources management in the Middle East, Eastern Mediterranean, and North Africa. His current research programs include establishing a multi-century network of climate records for the Eastern Mediterranean and North Africa based on tree rings by extending and enhancing existing tree-ring datasets, and by developing new tree-ring chronologies geographically and temporally. This network is being, and will continue to be, used to study interannual to century scale climate fluctuations in the region and their links to large-scale patterns of climate variability. He is a member of the Tree-Ring Society since 2005. He was member of Society of American Foresters from 1985-1994.

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AREAS OF SPECIALIZATION:

Dendrochronology and Chronometry, Navajo Archaeology, Southwest Archaeology, Spatial Analysis; Hunter-gatherers, Pastoralists. Geographic areas: Southwest, Northern Mexico, Great Basin, Northwest. Temporal Periods: Protohistoric and Early Historic.

CURRENT POSITIONS:

Adjunct Assistant Professor, Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ 85721

EDUCATION:

1997 Doctor of Philosophy in Anthropology, University of Arizona, Tucson, AZ 85712. GPA: 4.0. Ph.D. Dissertation title: *The Dendrochronology of the Navajo Pueblitos of Dinétah*. Committee Co-Chairs: Jeffrey S. Dean and J. Jefferson Reid.

1986 Master of Arts in Anthropology, Washington State University, Pullman WA 99164. GPA: 3.7. M.A. Thesis title: The Basin Creek Site: A Biface Lithic Technology from Central Idaho. Committee Chair: J. Jeffrey Flenniken.

1979 Bachelor of Arts degree in History, Lewis & Clark College, Portland, OR 97219. GPA: 3.0. Major Advisor: Stephen D. Beckham.

1976 Attended Colorado College, Colorado Springs, CO 80903.

PEER REVIEWED BOOKS, ARTICLES, CHAPTERS, AND BOOK REVIEWS:

Towner, Ronald H.

2003 *Defending the Dinétah: Tree-Rings and Pueblitos in the Ancestral Navajo Heartland*. University of Utah Press, Salt Lake City, UT.

Archaeological Tree-Ring Dating in the American Southwest. In *Proceedings of the Nara Internatonal Conference on Dendrochronology*, edited by Takumi Mitsutani. Nara National Cultural Properties Institute, Nara, Japan.

2002 Archaeological Dendrochronology in the US Southwest. *Evolutionary Anthropology.* 11(2):68-84.

Dykeman, D., R. H. Towner, and J. Feathers

2002 Correspondence in Tree-Ring Dating and Thermoluminescence Dating: A Protohistoric Navajo Pilot Study. *American Antiquity* 67(1): 145-164.

Towner, Ronad H., and Michael C. Clary

2001 Historical Dendroarchaeology in Central Colorado: Lessons from the Keystone Area. *Southwestern Lore* 67(3):8-32.

Towner, R. H., H. C. Rogers, and J. M. Copeland
2001 Changing Threats, Changing Responses: Tactical Aspects of the Navajo Pueblitos of Dinétah. In *The Archaeology of Ancient Tactical Sites*, edited by J. Welch and T. Bostwick, pp. 111-130. Arizona Archaeologist No. 32. Phoenix.

Towner, Ronald, Dave Grow, June Psaltis, and Alice Falzone
2001 The Importance of Sample Context in Dendroarchaeological Interpretation: An Example from Northwestern New Mexico, USA. *Tree-Ring Research* 57:73-86.

Ababneh, Linah, Ronald H. Towner, Mary M. Prasciunas, and Karen T. Porter.
2001 The Dendrochronology of Palluche Canyon, Dinétah. *Kiva* 66(2): 267-289.

Towner, Ronald H.
2000 The Navajo in Prehistory and History. In *The Entangled Past: Integrating History and Archaeology*. *Proceedings of the 30th Annual Chacmool Archaeological Conference, Calgary Alberta,* edited by M. Boyd, J.C. Erwin,m and M. Hendrickson, pp. 175-185. The Archaeological Association of the University of Calgary, Alberta.

Towner, Ronald H.
2000 Concordance and Conflict between Dendrochronology and Historical Records. In *A History of Archaeological Dating in North America*, edited by S. Nash, pp. 257-274. University of Utah Press, Salt Lake City.

Towner, Ronald H.
2000 Review of *Archaeological Chronometry* by F. Smiley and R. Ahlstrom, *Journal of Field Archaeology* 26(2):218-220.

Towner, Ronald H.
1999 Eighteenth Century Navajo Defensive Sites in the Dinétah. In *Archaeology Southwest (Spring 8-9).*

Wilshusen, Richard H., and Ronald H. Towner
1999 Post-Puebloan Occupation (A.D. 1300-1840). In *Colorado Prehistory: A Context for the Southern Colorado River Basin*, edited by W. D. Lipe, M. D. Varien, and R. H. Wilshusen, pp. 353-369. Colorado Council of Professional Archaeologists, Denver.

Towner, Ronald H., and Byron P. Johnson
1998 *The San Rafael Survey: Reconstructing Eighteenth Century Navajo Population Dynamics in the Dinétah using Archaeological and Dendrochronological Data.* Arizona State Museum Archaeological Series, No. 190. The University of Arizona, Tucson.

Towner, Ronald H., Leslie Sesler, and Tim Hovezak
1998 Navajo Culturally Modified Trees in the Dinétah. In *Diné Bikeyah: Papers in Honor of David M. Brugge*, edited by M. Duran and D. Kirkpatrick, pp. 195-209. Archaeological Society of New Mexico, Albuquerque.

Towner, Ronald H.
1997 *The Dendrochronology of the Navajo Pueblitos of Dinétah*. Ph.D. dissertation, Department of Anthropology, University of Arizona, Tucson. University Microfilms International, Ann

Arbor.

Towner, Ronald H. (editor)
1996 *The Archaeology of Navajo Origins.* University of Utah Press, Salt Lake City, UT.

Towner, Ronald H.
1996 The Pueblito Phenomenon: A New Perspective on Post-Revolt Navajo Culture. In *The Archaeology of Navajo Origins,* edited by R.H. Towner, pp. 149-170. University of Utah Press, Salt Lake City, UT.

Towner, Ronald H., and Jeffrey S. Dean
1996 Questions and Problems in Pre-Ft. Sumner Navajo Archaeology. In *The Archaeology of Navajo Origins,* edited by R.H. Towner, pp. 1-18. University of Utah Press. Salt Lake City, UT.

Towner, Ronald H.
1996 Review of *Dating in Exposed and Surface Contexts*, edited by Charlotte Beck. *Journal of Field Archaeology* 23(3):396-398.

Robinson, William J., and Ronald H. Towner
1993 *A Directory of Tree-Ring Dated Native American Sites in the American Southwest.* Laboratory of Tree-Ring Research, The University of Arizona, Tucson.

Towner, Ronald H.
1992 Dating the Dinétah Pueblitos: The Tree-Ring Data. In *Recent Research on Public Lands in New Mexico*, edited by J. Piper and L. Jacobson, pp. 59-71. BLM Cultural Resource Series No. 8. Albuquerque.

Towner, Ronald H., and Jeffrey S. Dean
1992 LA 2298: The Oldest Pueblito Revisited. *Kiva* 57(4):215-329.

Towner, Ronald H., and Miranda Warburton
1990 Projectile Point Rejuvenation: A Technological Analysis. *Journal of Field Archaeology* 17(3):310-321.

Towner, Ronald H.
- The Effects of Heat Treatment on Chert Tool Edge Damage. In *Lithic Resource Procurement: Proceedings from the Second Conference on Prehistoric Chert Exploitation*, edited by Susan A. Vehik, pp. 215-228. Occasional Paper No. 4, Southern Illinois Center for Archaeological Investigations, Carbondale.

GRANTS AND FELLOWSHIPS:

- Dendroarchaeology of the Range Creek Fremont. National Science Foundation. Principal Investigator, Laboratory of Tree-Ring Research, The University of Arizona, Tucson. (198K)

  Dendroarchaeological Investigations at the Samuel Ealy Johnson Homestead, LBJ National Park. Western National Parks Association. Principal Investigator, Laboratory of Tree-Ring Research, The University of Arizona, Tucson. (5K)

2004 Southwest Archaeological Tree-Ring Dating. National Science Foundation. Co-Principal Investigator with Jeffrey S. Dean, Laboratory of Tree-Ring Research, The University of Arizona, Tucson. (265K)

2003 The Evaluation of Paleo Data to Determine Past, Present, and Future Hydrologic Variability in Arizona. Water Reserach Resources Center, State of Arizona.Co-Principal Investigator with V. Baker, D. Meko. and J. Valdes. (53K).

2002 Expanding Dendroarchaeology into Northern Mexico. National Science Foundation, Principal Investigator, Laboratory of Tree-Ring Research, The University of Arizona, Tucson (108K).

International Travel Grant, University of Arizona Office of International Affairs. ($350).

2000 Expanding Dendrochronology to Historic Period Structures in Central Colorado. Faculty Development Grant, The University of Arizona, Tucson. (5K)

2000 Dendroarchaeology of the Navajo Occupation of the Southwest. National Science Foundation. Co-Principal Investigator with Jeffrey S. Dean, Laboratory of Tree-Ring Research, The University of Arizona, Tucson. (269K)

1996 Sigma Xi Travel Grant. ($500)

1996 Arizona Archaeological and Historical Society Research Grant (with Donn R. Grenda). ($250)

1996 Arizona Archaeology and Historical Society Travel Grant. ($250)

1995 Robert H. Lister Fellowship in Southwestern Archaeology. Crow Canyon Archaeological Center, Cortez, CO. (5K)

1994 AZ SHPO Matching Grant for San Pedro Trincheras Survey. Co-Principal Investigator with Jeffrey H. Altschul, Statistical Research, Tucson. (12K)

1993 NM SHPO Matching Grant for San Rafael Canyon Pueblito Survey. Co-Project Director with Byron Johnson, WCRM, Farmington. (19K)

1993 AZ SHPO Matching Grant for San Pedro Archaeological Project Survey. Co-Principal Investigator with Jeffrey H. Altschul, Statistical Research, Tucson. (11K)

1992 AZ SHPO Matching Grant for San Pedro Archaeological Project Survey. Co-Principal Investigator with Jeffrey H. Altschul, Statistical Research, Tucson. (11K)

1992 University of Arizona, Department of Anthropology Cummings Award ($250)

1992 University of Arizona Graduate College Research Grant ($500)

1991 Arizona Archaeological and Historical Society Scholarship ($200)

1991 Arizona Archaeological and Historical Society Research Grant ($250)

1991 Gilbert Altschul Fellowship, Statistical Research, Inc. (1K)

1989 Regents Fellow, University of Colorado (Declined). (1K)

COURSES TAUGHT

2006 Geos/Anth 497j/597j: Dendroarchaeology.Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Presession.

2005 Geos/Anth 497j/597j: Dendroarchaeology.Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Presession.

2004 Geos 220: Environmental History of the Southwest. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Fall Semester.

Ant/SW 204 Prehistory of the Southwest. Block 5. Colorado College, Colorado Springs, CO.

Geos/Anth 497j/597j: Dendroarchaeology.Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Presession.

2003 Geos/Anth 497j/597j: Dendroarchaeology. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Presession.

2002 Geos/Anth 497j/597j: Dendroarchaeology.Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Presession.

Navajo Archaeology. AAHS Short course, Arizona Archaeological and Historical Society, Tucson.

Geos 596e: Tree-Ring Dating in Archaeological Analysis. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Semester.

2001 Geos 596e: Tree-Ring Dating in Archaeological Analysis. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Semester.

2000 Geos/Anth 464/564: Introduction to Dendrochronology. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Fall Semester.

Geos 596e: Tree-Ring Dating in Archaeological Analysis. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Semester.

Geos 220: Environmental History of the Southwest. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Semester.

1999 Geos/Anth 464/564: Introduction to Dendrochronology. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Fall Semester.

Geos 596e: Tree-Ring Dating in Archaeological Analysis. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring Semester.

Geos 595e: Journal Club. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Spring.

1998 Geos/Anth 464/564: Introduction to Dendrochronology. Laboratory of Tree-Ring Research, University of Arizona, Tucson. Fall Semester.

Anthropology 205: Introduction to the Prehistory of the Southwest. Pima Community College, Tucson. Spring Semester (2 Sections).

Anthropology 110: Introduction to World Prehistory. Pima Community College, Tucson. Spring Semester.

1997 Anthropology 205: Introduction to the Prehistory of the Southwest. Pima Community College, Tucson. Fall Semester.

Anthropology 110: Introduction to World Prehistory. Pima Community College, Tucson. Spring Semester.

Anthropology 205: Introduction to the Prehistory of the Southwest. Pima Community College, Tucson. Spring Semester.

1996 Anthropology 205: Introduction to the Prehistory of the Southwest. Pima Community College, Tucson. Fall Semester.

Anthropology 205: Introduction to the Prehistory of the Southwest. Pima Community College, Davis Monthon Air Force Base, Tucson. Fall Semester.

1994 Anthropology 235: Principles of Archaeology. University of Arizona, Summer Session I.

1993 Anthropology 235: Principles of Archaeology. University of Arizona, Summer Session I.

1992 Anthropology 101: Introduction to Physical Anthropology and Archaeology. University of Arizona, Summer Session I.

Anthropology 101: Introduction to Physical Anthropology and Archaeology (Discussion Section Only), Department of Anthropology, University of Arizona, Tucson. Spring Semester.

1991 Anthropology 235: Principles of Archaeology. Teaching Assistant for Dr. Raymond H. Thompson, University of Arizona. (2 Semesters).

1990 Anthropology 101: Introduction to Physical Anthropology and Archaeology (Discussion Section Only), Department of Anthropology, University of Arizona. Fall Semester.

1987 Introduction to Beekeeping. Taught in Arabic. Centre pour le Formation Professionale Agricole des Jeunes Filles; Tibar, Tunisia.

1985 Flintknapping and Lithic Analysis. Intersession Short Course, Washington State University.

PAPERS PRESENTED/INVITED LECTURES

- Fruitland Project Impacts on Gobernador Phase Navajo Archaeology. Paper presented at the Pecos Conference, Farmington, NM.

- Dendroarchaeology of the Samuel Ealy Johnson Homestead, LBJ National Park. Paper presented both to the National Park Service employees and as a Public Lecture in Johnson City, TX.

Dendroarchaeology and dendroclimatology on the Pajarito Plateau: Syntheses and Future Possibilities. Paper presented at the Pecos Conference, Los Alamos, NM.

2004 Historical Archaeology: Southwest Style. Symposium co-chair. 69th Annual Meeting of the Society for American Archaeology, Montreal.

Historical Dendroarchaeololgy in the Largo-Gobernador Area. Paper presented at the 69th Annual Meeting of the Society for American Archaeology, Montreal.

2003 The Future of Archaeological Tree-Ring Dating in Sonora. Invited paper at the 30 Anos del INAH Sonora symposium, Hermosillo, Sonora Mexico.

Dendroarchaeology in Northern Mexico: Future Possibilities. Paper presented a the Pecos Conferences, Casas Grandes, Chihuahua, Mexico.

The Dendroarchaeology of the Navajo Land Claim. Paper presented at the 68th Annual Meeting of the Society for American Archaeology, Milwaukee. (co-authored with Jeffrey S. Dean and James A. Parks.)

Dendroarchaeology at Chankillo, Peru. Paper presented at the 68th Annual Meeting of the Society for American Archaeology, Milwaukee. (co-authored with Ron Winters and Ivan Ghezzi.)

2002 The Importance of Sample size in Dendroarchaeological Research. Paper presented at the VI International Conference on Dendrochronology, Quebec City, Quebec.

Dendroarchaeology in the Sierra Madre, Sonora, Mexico. Poster presented at the VI International Conference on Dendrochronology, Quebec City, Quebec.

2001 The Past and Future of Dendrochronology in Northern Mexico. Paper presented at the IV Conferencía de Archaeología, Paqimé, Chihuahua, Mexico.

Early Navajo Migrations in the Southwest: Lessons in Method and Theory. Paper presented at the 65th Annual Meeting of the Society for American Archaeology, New Orleans.

2000 Dendrochronology in the Great Basin: Problems and Possibilities. Poster presented at the Great Basin Anthropological Conference, Ogden, UT.

Archaeological Dendrochronology in the American Southwest. Paper presented at the Nara International Conference on Dendrochronology, Nara, Japan.

1999 Navajo Pueblito Communities: Recent Research in the Dinétah. Discussant paper presented at the 7th Fruitland Conference, Farmington, NM.

The Current State of Navajo Archaeology: Integrating Archaeology, Ethnography, History, and Oral Traditions. Paper presented at the 64th Annual Meeting of the Society for American Archaeology, Chicago.

Comparative Approaches to Dinétah and Plains Lithic Exchange from the Late Prehistoric through Historic Periods. (co-authored with T. Baugh and J. Torres). Paper presented at the 64th Annual Meeting of the Society for American Archaeology, Chicago.

Debitage Analysis in the Northern Southwest: Distinguishing Cultural Affiliation in the Fruitland Area. (co-authored with J. Torres). Paper presented at the 64th Annual Meeting of the Society for American Archaeology, Chicago.

1998 Climate and Navajo Pueblito Construction. Paper presented at the Tactical Sites Conference, Arizona Archaeological Council, Flagstaff, AZ.

The Athapaskan Entry into the Southwest: New Data and New Interpretations. (Co-authored with P. Hancock, L. Reed, and J. Torres). Paper presented at the 63rd Annual Meeting of the Society for American Archaeology, Seattle.

Comparing Tree-Ring and Thermoluminescence Dating: Navajo Examples. (Co-authored with D. Dykeman and J. Feathers). Paper presented at the 63rd Annual Meeting of the Society for American Archaeology, Seattle.

The Navajo Abandonment of Dinétah. Paper presented at the conference on the Protohistoric Period in the American Southwest, Albuquerque.

1997 The Navajo in History and Prehistory. Paper presented at the 30th Chacmool Conference, Calgary, AB.

Frances Mesa: Eighteenth Century Navajo Mobility and Land Use in Dinétah. Paper presented at the 5th Fruitland Conference, Farmington, NM.

The Applications of Historical Records and Dendrochronology to Interpretations of Navajo Archaeology. Paper presented at the 62nd Meeting of the Society for American Archaeology, Nashville, TN.

1996 Navajo Ethnogenesis: A Study of Eighteenth Century Navajo Archaeological Sites. Lister Fellow Invited Lecture. Crow Canyon Archaeological Center, Cortez, CO.

Early Navajo Chronometrics: An Outsider's View. Paper presented at the 4th Fruitland

Conference, Farmington, NM.

The Old Fort Project. Paper presented at the 4th Fruitland Conference, Farmington, NM.

Late Prehistoric Obsidian Distribution in Southern California: The Yucaipa't Village. (Co-authored with D. R. Grenda). Paper presented at the 61st Meeting of the Society for American Archaeology, New Orleans.

CA-RIV-2798: 8,000 Years of Lacustrine Adaptation in Inland Southern California. (Co-authored with D. R. Grenda). Paper presented at the 61st Meeting of the Society for American Archaeology, New Orleans.

1995 Reconstructing 18th Century Navajo Settlement and Population Dynamics in San Rafael Canyon, Dinétah. Paper presented at the 60th Annual Meeting of the Society for American Archaeology, Minneapolis, MN,; the 7th Navajo Studies Conference, Farmington, NM.; and the Laboratory of Tree-Ring Research, Tucson, AZ.

1994 Big Bead Mesa in Regional Perspective. Poster Presented at the 59th Annual Meeting of the Society for American Archaeology, Anaheim, CA.

The Dendrochronology of Navajo Pueblitos: Interpreting Dendrochronological and Architectural Data. Paper presented at the International Tree-Ring Conference, Tucson.

1993 The Pueblito Phenomenon: A New Perspective on Post-Revolt Navajo Culture. Paper presented at the 58th Annual Meeting of the Society for American Archaeology, St. Louis, MO. (Symposium Organizer and Co-chair).

1992 Dating the Dinétah Pueblitos: The Tree-Ring Data. Paper presented at the 57th Annual Meeting of the Society for American Archaeology, Pittsburgh, PA.

1990 Alternate Face Thinning and the Production of Lipped Flakes. Poster presented at the 55th Annual Meeting of the Society for American Archaeology, Las Vegas.

1988 Seasonality and Artifact Movement. (Co-authored with E.J. Miksa and L. McCabe-Benner). Paper presented at the AAA Conference, Phoenix.

Lithic Technology and Human Behavior at Bidahochi Ruin. (Co-Authored with Miranda Warburton). Paper presented at the New Mexico Lithic Analysis Concord, Abiquiu, NM.

1986 Lithic Procurement, Reduction, and Curation in the Rancho Rajneesh Project Area. Paper presented at the 38th Northwest Anthropology Conference, Moscow, ID.

1985 Projectile Point Rejuvenation: A Technological Analysis. Paper presented at the 50th Annual Meeting of the Society for American Archaeology, Denver, CO.

The Basin Creek Site: A Biface Lithic Technology from Central Idaho. Paper presented at the 38th Northwest Anthropology Conference, Ellensburg, WA.

1982 Demographics of the Kanaka Village. Paper presented at the 35th Northwest Anthropology

Conference, Vancouver, B.C.

CONTRACT REPORTS AND CHAPTERS

Towner, Ronald H., and Mathew W. Salzer

2006 Dendroclimatology on the Pajarito Plateau, NM. Report submitted to Los Alamos National Laboratory, Los Alamos, NM.

Towner, Ronald H., and Robert Heckman

2006 The Blanco Mesa Survey: A Class III Cultural Resources Survey of 200 Arcres on Blanco Mesa, San Juan County, New Mexico. Statistical Research Technical Report 06-28. Tucson.

Towner, Ronald H.

2003 Dendrochronology in the Morris 1 Project Area. In *The Morris Site 1 Early Navajo Land Use Study: Gobernador Phase Community Development in Northwestern New Mexico*, edited by D. Dykeman, pp. 345-403. Navajo Nation Papers in Anthropology No. 39. Window Rock, Arizona.

Towner, Ronald H.

2002 The Current Status of Archaeological Dendrochronology and Dendroclimatology of the Parajito Plateau, NM. Report submitted to Los Alamos National Laboratory, Los Alamos, NM.

Towner, Ronald H., and Mathew W. Salzer

2002 A Dendroclimatic Reconstruction for the Fruitland Area. Submitted to WCRM, Farmington, NM.

Sesler, Leslie M., and Ronald H. Towner

2000 Frances Mesa Lithic Analysis. In *Frances Mesa Alternative Treatment Project*, compiled by Richard H. Wilshusen, Timothy D. Hovezak, and Leslie M. Sesler, pp. 401-433. La Plata Archaeological Consultants Research Papers No. 3, vol. 1. Cortez, CO.

Towner, Ronald H., Alexander V. Benitez, and Keith B. Knoblock.

1998 Lithic Analysis. In *Between the Coast and the Desert: Archaeological Investigations at the Yukaipa't Site, CA-SBR-1000, Yucaipa, California,* edited by Donn R. Grenda, pp. 61-111. Technical Series No. 70. Statistical Research, Inc. Tucson.

Towner, Ronald H., Keith B. Knoblock, and Alex V. Benitez

1997 Flaked and Ground Stone Analyses. In *Continuity & Change 8,500 Years of Lacustrine Adaptation on the Shores of Lake Elsinore,* edited by Donn R. Grenda, pp. 263-349. Statistical Research Technical Series No. 59. Tucson.

Knoblock, Keith R., Alex V. Benitez, and Ronald H. Towner

1996 Lithic Artifact Analyses. In *On the Border: Analysis of Materials Recovered from the 1964 and 1991-1992 Excavations at The Garden Canyon Site (AZ EE:11:13)*, edited by S. D. Shelley and J. H. Altschul, pp. 65-98. Statistical Research Technical Series No. 61. Tucson.

Towner, Ronald H.

1995 Lithic analysis. In *LA 2804: A Game Monitoring Locale in the Prado Basin, Los Angeles*

County, California, edited by D. Grenda, pp. 43-86, Statistical Research Technical Series No. 43.

Towner, Ronald H., Alex C. Benitez, and Keith R. Knoblock
1995 Flaked and Ground Stone Analyses. In *Vanishing River: Landscapes and Lives of the Lower Verde Valley, The Lower Verde Archaeological Project*, edited by S. Whittlesey, R. Ciolek torrello, and J. Altschul. SRI Press, Tucson.

Towner, Ronald, H.
1994 Lithic Artifacts. In *The Roosevelt Rural Sites Study*: Prehistoric Rural Settlements in the Tonto Basin, edited by R. Ciolek-Torrello, S. Whittlesey, and S. Benaron, pp. 469-534. Statistical Research Technical Series No. 28, Vol. 2, Part 2. Tucson.

Towner, Ronald H.
1994 *The San Pedro Archaeological Project: A Cultural Resources Survey near Coronado National Monument, Southeastern Arizona*. Statistical Research Technical Report 94-21.

Towner, Ronald H., and Jeffrey H. Altschul
1993 *Cultural Dynamics in the Middle San Pedro Valley: A Cultural Resources Survey of 1300 Acres near Palominas, AZ.* Statistical Research Technical Report 93-5.

Towner, Ronald H.
1993 The Garden Canyon Project Part 2: Excavation at Two Rockshelters in the Huachuca Mountains, Southeastern Arizona. In *The Garden Canyon Project: Studies at Two Rockshelters, Huachuca Mountains, Southeastern Arizona*, compiled by J. Altschul, M. Cottrell, C. Meighan, and R. Towner. Statistical Research Technical Series No. 39. Tucson.

Altschul, Jeffrey H., and Ronald H. Towner
1993 Prehistoric Settlement in the Intermontane Regions of the Sand Tank Mountains. In *Intermontane Settlement Trends in the Eastern Papagueria*, edited by J. Homburg, J. Altschul, and R. Vanderpot. pp. 249-286. Statistical Research Technical Series No.37. Tucson.

Towner, Ronald H.
1992 Dating the Dinétah Pueblitos: An Interim Report on the 1991 Field Season. Ms. on file, Bureau of Land Management, Albuquerque, NM.

Towner, Ronald H.
1992 Lithic Analysis. In *Farming the Floodplain: A Look at Prehistoric and Historic Land-Use along the Rillito*, edited by R. Ciolek-Torrello and K. Harry, pp. 23-124. Statistical Research Technical Series No. 35. Tucson.

Towner, Ronald H.
1992 Admiralty Site Lithic Analysis. In *Life in the Ballona: Archaeological Investigations at the Admiralty Site (CA-LAn-47) and the Channel Gateway Site (CA-LAn-1596h*) edited by Jeffrey H. Altschul and Richard Ciolek-Torrello, pp. 348-425. Statistical Research Technical Series No 31. Tucson.

Towner, Ronald H.

1992 Flaked and Ground Stone Analyses. In *Human Adaptation in the Lukachukai Valley: The N13 Project*. Statistical Research Technical Series (Draft).

Towner, Ronald H.
1991 Dating the Dinétah Pueblitos: An Interim Report on the 1990 Field Season. Ms. on File, Bureau of Land Management, Albuquerque, NM.

Towner, Ronald H.
1990 Lithic Analysis. In *The Elder Gulch Project: Archaeological Test Excavations at Ten Sites near Kelvin, Pinal County, Arizona.* MS on file at SWCA, Inc., Tucson.

Towner, Ronald H., and John A. Draper
1986 Lithic analysis for the Calispell Valley Archaeological Project. In *Calispell Valley Archaeology Project: Interim Report*, edited by A. V. Thoms and G. C. Butchard, pp. 553-596. Contributions in Cultural Resource Management No. 10. Center for Northwest Anthropology, WSU, Pullman.

Towner, Ronald H.
1984 Demographics of the Kanaka Village 1827-1860. In *Excavations at the Kanaka Village/Fort Vancouver Barracks 1980-1981*, edited by Bryn Thomas and Charles Hibbs, pp. 793-812. Eastern Washington University Reports of Investigations.

FIELDWORK EXPERIENCE:

1990-pres Principal Investigator, Navajo Pueblito Dating Project, Laboratory of Tree-Ring Research, Tucson,85721. Duties: Collection, Analysis, and Interpretation of Dendrarchaeological Samples from 18th century Navajo sites in nothwestern New Mexico.

1999-pres Principal Investigator, Central Colorado Historical Dendrochronology Project, Laboratory of Tree-Ring Research, Tucson, AZ 85721. Duties: Collection and Interpretation of Dendrochronological Samples from 19th century mining sites in central Colorado.

- Principal Investigator, LBJ Dendroarchaeology Project, Johnson City, TX.. Laboratory of Tree-Ring Research, Tucson, AZ 85721. Duties: Collection, Analysis, and Interpretation of Dendroarchaeological Samples from Lyndon B. Johnson National Historical Park.

  Principal Investigator, Archaeological Survey of Navajo Sites Blanco Mesa, NM. Manzanares Research, Tucson, AZ 85721. Duties: Archaeololgical survey, site recording, and reporting of Navajo archaeological sites in northwestern New Mexico.

  Principal Investigator, Pajarito Plateau Dendroclimatic Reconstruction and Synthesis, Manzanares Research, Tucson, AZ 85712. Duties: Collection of live-tree samples and supervision of dendrolimatic reconstruction for Los Alamos National Laboratory and Pajarito Plateau, NM.

2004 Principal Investigator, La Ventana Mesa Navajo Dendroarchaeology Project, Albuquerque District BLM. Mwanzanares Research,, Tucson, AZ 85712. Duties: Collection and Interpretation of Dendrochronological Samples from Navajo sites near Cuba, New Mexico.

2003 Principal Investigator, Sierra Madre Dendroarchaeology Project, Sonora, Mexico. Laboratory of Tree-Ring Research, Tucson, AZ 85721. Duties: Collection and Interpretation of Dendrochronological Samples from cliff dwellings in northern Mexico.

Project leader. Archaeology and Tree-Rings in the Dinétah. Sierra Club Service Project in coordination with Farmington Bureau of Land Management. Duties: Organization and supervision of 12 volunteers mapijng and collecting tree-ring samples from Gobernador Village site.

Principal Investigator, Prescott Live-tree collection. Duties: Collection and interpretation of live-tree samples from Prescott, AZ area for climatic reconstruction purposes.

2002 Principal Investigator, Chankillo Dendroarchaeology Project, Casma, Peru.Dendrochronology Project, Laboratory of Tree-Ring Research, Tucson, AZ 85721. Duties: Collection and Interpretation of Dendrochronological Samples from 3rd century fortified site in coastal Peru.

2001 Project Consultant, Sierra Madre Dendroarchaeology Project, Sonora, Mexico. Laboratory of Tree-Ring Research, the University of Arizona, Tucson. Duties: Collection and Interpretation of Dendrochronological Samples from cliff-dwellings in northern Mexico.

1997 Lithic Analyst, Project Director. La Plata Archaeological Consultants. Duties: Synthesis of Navajo lithic assemblage characteristics for Fruitland Project sites.

1989-1996 Lithics Division Director/Lithic Analyst. Statistical Research, Inc., Tucson. Duties: Developed research designs, questions, and methodologies pertaining to various lithic assemblages excavated by SRI. Supervised other lithic analysts when necessary, editor and senior author of lithics chapters in CRM reports.

1993 Project Director, San Pedro Archaeological Project. Statistical Research, Inc. Tucson, AZ. Duties: Project Development, Supervision, and Report Writing for 720 Acre survey near Hereford, AZ.

Project Director, The San Rafael Canyon Pueblito Survey of Eighteenth Century Navajo Communities, Western Cultural Resources Management, Farmington, NM. Duties: Project Development, Coordination and Report Writing for 640 acre survey around two large Navajo pueblitos in northwestern New Mexico.

1992 Project Director, San Pedro Survey Archaeological Project, Statistical Research, Inc. Tucson, AZ. Duties: Project Development, Supervision, and Report Writing for various survey projects in the middle San Pedro River valley.

1991 Project Director. Fort Huachuca Garden Canyon Excavations. Statistical Research, Inc., Tucson. Duties: Supervised excavation, analysis, and report writing.

1988 NTUA Project Supervisor, Navajo Nation Archaeology Department, Window Rock, AZ 86515. Duties: Project Contracting, Supervision, and Coordination, Report Writing, Archaeological Survey for Navajo Tribal Utility ROW Acquisition.

1987 Staff Archaeologist, Navajo Nation Archaeology Department, Window Rock, AZ 86515.

Duties: Archaeological Survey, Project Supervision, Report Writing and Editing.

1985 Archaeological Survey and Excavation, Bureau of Land Management, Prineville, OR. Duties: Archaeological Survey, Research Design, Testing and Excavation Strategy Design and Implementation.

1984 Archaeological Survey. Bureau of Land Management, Lakeview, OR.

Archaeological Excavation. Deetz Clovis Site, Wagontire, OR. University of Oregon, Eugene. Duties: Archaeological Excavation.

Archaeological Survey, Hodzana River Project, Beaver, Alaska. PIII Associates, Salt Lake City. UT. Duties: Archaeological Survey and In-Field Lithic Analysis.

Archaeological Excavation, Crew Chief, Well Reservoir Archaeological Project, Center for Northwest Anthropology, Washington State University, Pullman.

1983 Archaeological Excavation, Wells Reservoir Archaeological Project, Center for Northwest Anthropology, Washington State University, Pullman. Duties: Archaeological Excavation.

1982 Archaeological Survey, Agency for Conservation Archaeology, Eastern New Mexico University, Portales. Duties: Archaeological Survey.

1981 Archaeological Excavation and Laboratory Organization, Priest Rapids Dam Archaeological Project, Eastern Washington University, Cheney. Duties: Archaeological Excavation and Laboratory Direction.

Archaeological Excavation and Site Photography, Kanaka Village/Ft. Vancouver Barracks Archaeological Project, Eastern Washington University, Cheney. Duties: Archaeological Excavation and Site Photography.

1980 Archaeological Survey, US Forest Service, Malheur National Forest, Burns, OR. Duties: Archaeological Survey and Report Writing.

1979 Archaeological Excavation, Columbia River Estuary Project, University of Oregon, Eugene. Duties: Archaeological Excavation.

ANALYSIS EXPERIENCE:

1997-1998

Lithic Analysis of Fruitland Project Lithic Assemblages. La Plata Archaeological Consultants. Mr. Steve Fuller, President. Technological analysis of 46 Archaic, Basketmaker, Puebloan, and Navajo assemblages from northwestern New Mexico.

1995 Lithic Analysis of the Lake Elsinore (CA-RIV-2798) lithic assemblage. Statistical Research, Inc. Jeffrey H. Altschul, director. Technological analysis of Early Holocene assemblage from southern California.

Lithic Analysis of the Yucaipa't Village assemblage. Statistical Research, Inc. Jeffrey H. Altschul, director. Technological analysis of lithic assemblage from a Late Prehistoric site in

southern California.

1994 Lithic Analysis of the Lower Verde Project Lithic Assemblages. Statistical Research, Inc. Jeffrey H. Altschul, director. Technological analysis of lithic assemblages from 26 Formative and Protohistoric sites in the Verde River area.

1993 Lithic Analysis of Prado site (CA-Riv-2804) lithic assemblage. Statistical Research, Inc. Jeffrey H. Altschul, director. Technological analysis of lithic assemblage from a Late Prehistoric site in southern California.

1992 Lithic Analysis of the Roosevelt Rural Sites Study Project. Statistical Research, Inc. Jeffrey H. Altschul, director. Technological analysis of lithic assemblages from 29 sites (archaic to protohistoric), Roosevelt Lake area (Arizona).

1990 GIS Spatial analysis for the ARNG Helicopter Gunnery Range Project. Statistical Research. Inc. Lithic analysis of the LAN-47 Project assemblage. Technological analysis of lithic artifacts from a late prehistoric shellfish processing site in southern California. Statistical Research, Inc.

Lithic analysis of the Elder Gulch sites. Technological analysis of ten Hohokam/ Salado assemblages from central Arizona. SWCA, INC. Mr. Thomas Euler, Project Director.

1989 Lithic analysis of the Lukachukai Project assemblage. Technological analysis of 13 Archaic/Anasazi/Navajo lithic assemblages from northern Arizona. Statistical Research, Inc.

1985 Lithic analysis of the Kalispell Valley Archaeological Project assemblages. Technological analysis of 5 Archaic assemblages from eastern Washington. Center for Northwest Anthropology, Washington State University, Pullman.

1984 Lithic Analysis of CA-MNT-1087 assemblage. Lithic Analysts, Inc., Dr. J. Jeffrey Flenniken, Director.

1983 Lithic analysis of Wells reservoir Archaeological Project assemblages. Analysis of 9 Archaic assemblages from central Washington. Center for Northwest Anthropology.

1984 Lithic analysis of CA-MNT-1215 assemblage. Lithic Analysts, Inc. Dr. J. Jeffrey Flenniken, Director.

Lithic analysis of 45-PI-251 assemblage. Lithic Analysts, Inc., Dr. J. Jeffrey Flenniken, Director.

1982 Lithic analysis of Priest Rapids Dam Archaeological Project assemblages. Archaeological and Historical Services, Eastern Washington University, Cheney.

LANGUAGES:

French: Reading and writing, some spoken

Tunisian Arabic: Spoken only, not a written language.

FIELDSCHOOLS:

1983 The Flintknapping Fieldschool. Taught by Dr. J. Jeffrey Flenniken, Washington State University, Pullman.

1979 Historical Archaeology: An Aurora Colony Farm. Taught by Dr. Rick Minor, University of Oregon, Eugene.

OTHER EXPERIENCE:

1999-2006 Acquisitions Editor. *Kiva*, Arizona Archaeological and Historical Society, Tucson.

1993-2004 Book Review Editor, *Kiva*, Arizona Archaeological and Historical Society, Tucson.

2005 Board of Directors, Southwest Ceramic Research Center, Farmington, NM.

1999-2000 Board of Directors, Old Pueblo Archaeology, Tucson.

1996-1998 Instructor, Department of Anthropology, Pima Community College, Tucson, AZ.

1991-1994 Instructor, Department of Anthroplogy, University of Arizona, Tucson.

1991-1995 Board of Directors, Arizona Archaeological and Historical Society, Tucson.

1993-1994 Assistant Editor, *Kiva*, Arizona Archaeological and Historical Society, Tucson.

1993-1994 President, Arizona Archaeological and Historical Society, Tucson.

1992-1993 Editorial Assistant, *Kiva*, Arizona Archaeological and Historical Society, Tucson.

1991-1992 Vice-President for Activities, Arizona Archaeological and Historical Society, Tucson.

1986-1987 Beekeeping Extension Agent, US Peace Corps, Beja, Tunisia.

REFERENCES:

Dr. Jeffrey S. Dean, Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ 85721. (520) 621-2320. e-mail: JDEAN@LTRR.ARIZONA.EDU

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Mr. James Copeland, BLM-Farminton, 1235 La Plata Highway, Farminton, NM 87401. e-mail: copeland @cyberport.com.

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Dr. Miranda Warburton, Department of Anthropology, Northern Arizona University, Flagstaff, AZ. (520) 523-7428.

Dr. J. Jefferson Reid, Department of Anthropology, University of Arizona, Tucson, AZ 85721. (520)

621-8546. e-mail: JREID@ANTHRO.ARIZONA.EDU

Dr. Jenny Adams, Desert Archaeology, 3975 N. Tucson Blvd., Tucson, AZ 85716. (520) 881-2244. e-mail: jenny@desert.com

Resume

Name: Peter Frederick Ffolliott

Title: Professor, School of Natural Resources, and Professor, Arid Lands Studies Program, College of Agriculture and Life Sciences, University of Arizona, Tucson, Arizona. Watershed Management Specialist, Arizona Agricultural Experiment Station

Contacts: School of Natural Resources, College of Agriculture and Life Sciences, University of Arizona, Tucson, Arizona 85721; telephone - 520-621-7276, fax - 520-621-8801, e-mail - ffolpete@ag.arizona.edu

Education: B.S., Forest Management University of Minnesota, 1958; M.F., Forest Management-Wildlife Management, University of Minnesota, 1959; PhD, University of Arizona, Watershed Management, 1970. (Other coursework at Colorado State University and Northern Arizona University)

Specializations: Integrated watershed, forest, and range and wildlife management; hydrologic processes and evaluation; fire effects on ecological and hydrological processes; mensuration and inventory techniques; economic assessments and evaluations, hydrologic and ecosystem modeling and simulation; environmental and natural resources policies

Employment Record: Research Forester, Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Flagstaff, Arizona, 1961-67; Assistant Professor, Associate Professor, Professor, School of Renewable Natural Resources, University of Arizona, Tucson, Arizona, 1967-present

Teaching Experience: Instructor, Assistant Professor, Associate Professor, Professor, School of Renewable Natural Resources, University of Arizona, Tucson, Arizona; undergraduate and graduate-level courses watershed hydrology, watershed management, natural resources management practices, forest management practices, ecosystem simulation and modeling techniques, and economic assessments and evaluations

Current Research Programs: Holistic ecosystem management practices in forest and woodland ecosystems of the southwestern United States; improving yield, quality, and distribution of water resources in forest and woodland ecosystems of the southwestern United States; strategies and tactics for management and sustainable utilization of renewable natural resources; effects of fire on ecosystem and hydrologic processes; assessments and evaluations of integrated ecosystem management practices; hydrologic simulation procedures; growth and yield models of tree and shrub species and related stand structures; economic assessments and evaluations of multiple use natural resources management programs; applications of decision support systems in the management of natural Resources; policy issues and evaluation in relation to conservation, sustainable development, and management of forests and woodlands, water, and other natural resources on watershed landscapes

Extramural Positions in Recent Years: Chairman, Temperate Forest Directorate, U.S. Man and the Biosphere Program, Washington, D.C.,1978-89; Panel on Rehabilitation and Management of Semi-Arid and Marginal Rangelands, National Research Council, National Academy of Sciences, Washington, D.C., 1984-90; Chair, Dryland Forestry Program, School of Natural Resources, College of Agriculture and Life Sciences, University of Arizona, Tucson, Arizona, 1986-96; Faculty, Programa de Edstudios de Posgrado, Centro de Investigaciones Biologicas de Baja California Sur, La Paz, B.C.S., Mexico 1993-2001; Research and Demonstration Advisory Committee, International Arid Lands Consortium, Tucson, Arizona, 1994-present; Technical Advisory Committee, International Arid Lands-Agency of International Development Project on Sustainable Development of Drylands in Asia and the Middle East, 2002-present; Science Advisory Board, Bureau of Land Management, Washington, D.C., 2004; Science Advisory Committee, Malpai Borderlands Group, 2002-present; President, Arizona-Nevada Academy of Science, 2005-2006; Panel on Hydrologic Impacts of Forest Management Practices, National Research Council, National Academy of Sciences, Washington, D.C., 2006-present.

International Experience: Short- and long-term assignments in project planning, evaluation and review and teaching and technical training activities in Mexico, Central and South America, Caribbean, Dominican Republic, West (Sahel) and Southern Africa, the Middle East and Turkey, People's Republic of China, Taiwan, Nepal, India, and Southeast Asia including the Philippines, Thailand, Malaysia, and Indonesia

Professional Societies and Organizations:

Society of American Foresters (Fellow), International Society of Tropical Forestry, American Water Resources Association, Arizona Hydrological Society, Indian Association of Hydrologists (Life Member, Fellow), Forest Products Research Society, Arizona-Nevada Academy of Science (Fellow), Society for Range Management, The Wildlife Society, IURFRO Working Party S1.03.02, S1.05.06, S4.07.03, Sigma Xi, and Xi Sigma Phi

Publications:

Total Number: 539

Selected Publications Since 2000:

Fox, Kel M., Peter F. Ffolliott, Malchus B. Baker, Jr., and Leonard F. DeBano. 2000. More water for Arizona: History of the Arizona Watershed Program and the Arizona Water Resources Association. Primer Publishers, Phoenix, Arizona, 118 p.

Lopes, Vicente L., Peter F. Ffolliott, and Malchus B. Baker, Jr. 2001. Impacts of vegetative practices on suspended sediment from watersheds of Arizona. Journal of Water Resources Planning and Management 127:41-47.

Ffolliott, Peter F. 2001. Updating hydrologic time-trend response functions of fire impacts. Hydrology and Water Resources in Arizona and the Southwest 31:21-24.

Ffolliott, Peter F., Malchus B. Baker, Jr., Carleton B. Edminster, Madelyn C. Dillon, and Karen L. Mora. 2002. Land stewardship through watershed management: Perspective for the 21st century. Kluwer Academic/Plenum Publishers, New York, New York, 137 p.

Ffolliott, Peter F., Kenneth N. Brooks, and Martin M. Fogel. 2002. Managing watersheds for sustaining agriculture and natural resource benefits into the future. Quarterly Journal of International Agriculture 41 (2002):23-40.

Ffolliott, Peter F., and Kenneth N. Brooks. 2002. Watershed management: A rational approach to producing, conserving, and sustaining natural resources. Annals of Arid Zone 40 (3&4):1-16.

Brooks, Kenneth N., Peter F. Ffolliott, Hans M. Gregersen, and Leonard F. DeBano. 2003. Hydrology and the management of watersheds. Iowa State Press, Ames, Iowa, 574 p. (Third Edition)

Ffolliott, Peter F., Malchus B. Baker, Jr., Aregai Tecle, and Daniel G. Neary. 2003. A watershed management approach to land stewardship. Journal of the Arizona Academy of Science (Special Issue: Watershed Management in Arizona) 35:1-4.

Ffolliott, Peter F., and Daniel G. Neary. 2003. Impacts of a historical wildfire on hydrologic processes: A case study in Arizona. In: Pfeffer, Max J., Daniel J. Van Abs, and Kenneth N. Brooks, editors. Watershed management for water supply systems: Proceedings of the American Water Resources Association 2003 International Congress. [CD-ROM] Windows

Baker, Malchus B., Jr., Peter F. Ffolliott, Leonard F. DeBano, and Daniel G. Neary. 2004. Riparian areas of the southwestern United States: Hydrology, ecology, and management. Lewis Publishers, Boca Raton, Florida, 408 p.

Ffolliott, Peter F. 2004. Quality of stormflow contributing to downstream water supplies: Impacts of land use practices in the southwestern United States. IDS-Water 2004: On-Line Conference and Exhibition. Chicago, Illinois.

DeBano, Leonard F., Peter F. Ffolliott, and Malchus B. Baker, Jr. 2004. Fifty years of watershed management in the Southwest: Some lessons learned. In: Ice, George G., and John D. Stednick, editors. A century of forest and wildland watershed lessons. Society of American Foresters, Bethesda, Maryland, pp. 17-31.

Ffolliott, Peter F., and Leonard F. DeBano. 2004. Hough's Encyclopedia of American Woods: Volume XV. Robert Speller & Sons Publishers, Inc., New York, 118 p.

Ffolliott, Peter F. 2005. A Water Budget for Emory Oak Woodlands of Southeastern Arizona: An Expansion of the Initial Approximation. Hydrology and Water Resources in Arizona and the Southwest 34:11-14.

Neary, Daniel G., and Peter F. Ffolliott. 2005. Silvopastoralism and watershed management in the southwestern United States. In: Brooks, Kenneth N., and Peter F. Ffolliott, editors. Moving agroforestry into the mainstream. Proceedings of the Ninth North American Agroforestry Conference, Department of Forest Resources, College of Natural Resources, University of Minnesota, St. Paul, Minnesota. CD-ROM (Windows)

Mitchell, John E., Peter F. Ffolliott, and Marcia Patton-Mallory. 2005. Back to the future: Forest Service rangeland research and management. Rangelands 27(3):19-28.

Neary, Daniel G., and Peter F. Ffolliott. 2005. The water resource: Its importance, characteristics, and general responses to fire. In: Neary, Daniel G., Kevin C. Ryan, and Leonard F. DeBano, editors. Wildland fire in ecosystems: Effects of fire on soil and water. USDA Forest Service, General Technical Report RMRS-GTR-42-Volume 4, pp. 95-106.

DeBano, Leonard F., and Peter F. Ffolliott. 2005. Ecosystem management in the Madrean Archipelago: A 10-year (1994-2004) historical perspective. In: Gottfried, Gerald J., Brooke S. Gebow, Lane G. Eskew, and Carleton B. Edminster, compilers. Connecting mountain islands and desert seas: Biodiversity and management of the Madrean Archipelago II. USDA Forest Service, Proceedings RMRS-P-36, pp.9-14.

Gottfried, G. J., D. G. Neary, and P. F. Ffolliott. 2005. A watershed study to determine the effects of prescribed burning on oak savannas in the American Southwest: Preliminary results. Poster Paper, 4th USGS Fire Science Workshop, Tucson, Arizona, December 6-9, 2005. Abstract.

Stropki, Cody L., Peter F. Ffolliott, Leonard F. DeBano, and Daniel G. Neary. 2006. Water-repellent soils on the Stermer Ridge watersheds after the Rodeo-Chediski Wildfire: A preliminary assessment. Hydrology and Water Resources in Arizona and the Southwest 35:47-50.

Neary, Daniel G., Gerald J. Gottfried, Jan L. Beyers, and Peter F. Ffolliott. 2006. Floods and sediment yields from recent wildfires in Arizona. In: Proceedings of the Eighth Federal Interagency Sedimentation Conference, Reno, Nevada, April 206, 2006. (CD-ROM) Windows

CURRICULUM VITAE

Lisa J. Graumlich

Education

B.S., Department of Botany, University of Wisconsin-Madison, 1975
M.S., Department of Geography, University of Wisconsin-Madison, 1978
Ph.D., College of Forest Resources, University of Washington, 1985

Current Position

Executive Director, Big Sky Institute, November 2001- present
Professor, Land Resources and Environmental Sciences, Montana State University, June 1999 to present

Past Positions

Post-Doctoral Research Associate, Department of Ecology, Evolution and Behavior, University of Minnesota, 1986
Assistant Professor, Department of Geography, UCLA, 1986-1988
Assistant Professor, Laboratory of Tree-Ring Research, University of Arizona, 1988 to 1993
Associate Professor, Laboratory of Tree-Ring Research, University of Arizona, 1993 to 1999
Director, Institute for the Study of Planet Earth, University of Arizona, 1993 to 1997
Deputy Director and Dean of the Earth Learning Center, Biosphere 2 Center, Columbia, University, 1997 to 1998 (on leave of absence from University of Arizona)
Adjunct Associate Professor, Earth and Environmental Sciences, Columbia University, 1998 to 2000
Director, Mountain Research Center, Montana State University, June 1999 to 2001

Leadership and Memberships in Professional Organizations

Co-Organizer, Integrated History and Future of People on Earth, Dahlem Conference, June 2005
Scientific Advisory Board, National Center for Ecological Analysis and Synthesis, 2003-2006
Co-Chair, Land Project Transition Team, International Geosphere Biosphere Program and International Human Dimensions Program, 2000-2003
Vice-Chair, Land Use and Land Cover Change Core Project, International Geosphere Biosphere Program and International Human Dimensions Program, 2000-2005
Member, Steering Committee, Mountain Research Initiative, International Geosphere Biosphere Program and International Human Dimensions Program, 2000-present
Steering Committee, 1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community. IGES, Japan.
Steering Committee, 1997 Open Meeting of the Human Dimensions of Global Environmental Change Research Community. Vienna.
Member, Global Energy and Water Cycle Experiment (GEWEX) Panel, National Research Council, 1993-1995
Member, Working Group on Terrestrial Ecosystems and Global Change, subcommittee of Committee on Global Change, National Academy of Science, 1991-1993
Member, Working Group on Earth System History and Modeling, subcommittee of Committee on Global Change, National Academy of Science, 1990-1991
Delegate, PAGES Workshop, High Resolution Records of Past Climate from Monsoon Asia: The Last 2000 Years and Beyond, International Geosphere Biosphere Program (IGBP), Taipei, Taiwan, May 1993
Delegate, Climate Studies Workshop, United States-Peoples' Republic of China Cooperation in the Field of Atmospheric Sciences and Technology, National Science Foundation, May 1992

Editorial Boards: *Ecological Applications*, 1995-1997, *Physical Geography*, 1989-present

Ecological Society of America (Secretary 1998-2000)
Association of American Geographers
American Geophysical Union
American Association for the Advancement of Science
Tree-Ring Society (Treasurer 1992-1998)

Awards, and Special Appointments
W.J. Cooper Award, Ecological Society of America, 1998 (for outstanding paper)
Distinguished Researcher in Residence, Mountain Research Center, Montana State University, 1997
Fellowship, Udall Center for Studies in Public Policy, University of Arizona 1996-97
Fellow, American Association for the Advancement of Science, 2004

Selected Publications
Peer-reviewed journal articles

Graumlich, L.J. and L.B. Brubaker. 1986. Reconstruction of annual temperature (1590-1979) for Longmire Washington derived from tree rings. *Quaternary Research* 25, 223-234.

Spaulding, W.G. and L.J. **Graumlich**. 1986. The last pluvial climatic episode in the deserts of southwestern North America. *Nature* 319, 441-444.

Graumlich, L.J. 1987. Precipitation variation in the Pacific Northwest (1675-1975) as reconstructed from tree rings. *Annals, Association of American Geographers* 77, 19-29.

Brubaker, L.B., L.J. **Graumlich**, and P.M. Anderson. 1987. Classification of *Picea* pollen grains in Alaska using maximum likelihood discriminate analysis. *Canadian Journal of Botany* 65, 899-906.

Graumlich, L.J., L.B. Brubaker and C.C. Grier. 1989. Long-term trends in forest net primary productivity: Cascade Mountains, Washington. *Ecology* 70, 405-410.

Graumlich, L.J. 1991. Subalpine tree growth, climate, and increasing CO_2: an assessment of recent growth trends. *Ecology* 72: 1-11.

Graumlich, L.J. 1993. A 1000-year record of temperature and precipitation in the Sierra Nevada. *Quaternary Research* 39, 249-255.

Graumlich, L.J. and M.B. Davis. 1993. Holocene variation in spatial scales of vegetation pattern in the Upper Great Lakes. *Ecology* 74,826-839.

Graumlich, L.J. 1993. Response of tree growth to climatic variation in the mixed conifer and deciduous forests of the Upper Great Lakes region. *Canadian Journal of Forest Research* 23, 133-143.

Graumlich, L.J. 1994. High resolution pollen analysis provides new perspective on catastrophic elm decline. *Trends in Ecology and Evolution* 8, 387-388.

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.

Sheppard, P.R., L.J. **Graumlich** and L.E. Conkey. 1996. Long-term trends in summer temperature for Maine inferred from tree-ring data. *The Holocene 6, 62-68*.

Kang, X., **Graumlich**, L.J., Sheppard, P.R. 1997. A 1,835 year tree-ring chronology and its preliminary analyses in Dulan region, Qinghai. *Chinese Science Bulletin* 42(13): 1122-1124.

Sheppard, P.R., Holmes, R.L., **Graumlich**, L.J. 1997. The "Many Fragments Curse:" A special case of the segment length curse. *Tree-Ring Bulletin* 54: 1-9.

Lloyd, A.H. and L.J. **Graumlich**. 1997. Holocene dynamics of treeline forests in the Sierra Nevada. *Ecology* 78, 1199-1210.

Dickinson, Robert E., Shaikh, Muhammad, Bryant, Ross, **Graumlich**, Lisa. 1998. Interactive Canopies for a Climate Model. *Journal of Climate* 11: 2823-2836

Gorham, E., G.S. Brush, L.J. **Graumlich**, M.L. Rosenzweig, and A.H. Johnson. 2001. The value of paleoecology as an aid to monitoring ecosystems and landscapes, chiefly with reference to North America. *Environmental Reviews* 9, 99-126.

Hessl, A. and L.J. **Graumlich**, 2002. Interactive effects of human activities, herbivory, and fire on quaking aspen (*Populus tremuloides*) age structures in western Wyoming. *Journal of Biogeography* 29, 889-902.

Graumlich, L.J., M.F.J. Pisaric, L.A. Waggoner, J.S. Littell, and J.C. King. 2003. Upper Yellowstone River flow and teleconnections with Pacific basin climate variability during the past three centuries. *Climatic Change* 59, 245-262.

Bunn, A. G., R.L. Lawrence, G.J. Bellante, L.A. Waggoner, and L.J. **Graumlich**. 2003. Spatial variation in distribution and growth patterns of old growth strip-bark pines. *Arctic, Antarctic and Alpine Research* 35:323-330.

Millar, C.I., R.D. Westfall, D.L. Delany, J.C. King, and L.J. **Graumlich**. 2004. Response of subalpine conifers in the Sierra Nevada, USA, to twentieth century warming and decadal climate variability. *Arctic, Antarctic, and Alpine Research*, 36, 181-200.

Gray, S.T., L.J. **Graumlich**, J.L. Betancourt, and G.T. Pederson. 2004. A tree-ring based reconstruction of the Atlantic Multidecadal Oscillation since 1567 A.D. *Geophysical Research Letters*, 31, No. 12, L12205 10.1029/2004GL019932

Bunn, A.G., L.A. Waggoner, and L.J. **Graumlich**. 2004**.** Topographic mediation of growth in high elevation foxtail pine (Pinus balfouriana Grev. et Balf.) forests in Sierra Nevada, USA. *Global Ecology and Biogeography* 14: 103-114.

Pederson, G.T., D.B. Fagre, S.T. Gray and L.J. **Graumlich**. 2004. Decadal-scale climate drivers for glacial mass balance in Glacier National Park, Montana, USA. *Geophysical Research Letters* 31, L12203 10.1029/2004GL019770

Bunn, A.G., T.J. Sharac, and L.J. **Graumlich**. 2004. Using a simulation model to compare methods of tree-ring detrending and to investigate the detectability of low-frequency signals. *Tree-Ring Research* 60, 77-90.

Sheppard, P.R., Tarasov, P.E. **Graumlich**, L.J., Heussner, K.-U., Wagner, M. Osterle, H. and Thompson, L.G. 2004. Annual precipitation since 515 BC reconstructed from living and fossil juniper growth of northeastern Qinghai Province, China. *Climate Dynamics*, 23, 869-881.

Bunn, A.G., L.J. **Graumlich**, and D.L. Urban. 2005**.** Interpreting the climatic significance of trends in twentieth-century tree growth at high elevations. The Holocene 15(4): 481-488.

Pederson, GT, S.T. Gray, D.B. Fagre, and L.J. **Graumlich**. 2006. Long-Duration Drought Variability and Impacts on Ecosystem Services: A Case Study from Glacier National Park, Montana USA. *Earth Interactions 10: 1-28*

Peer-reviewed books and book chapters

Graumlich, L.J. 1994. Long-term vegetation change in mountain environments: Paleoecological insights into modern vegetation dynamics. In *Mountain Environments in Changing Climates*, M. Beniston, ed., Routledge, London, pp. 167-179.

Graumlich, L.J. and L.B. Brubaker. 1995**.** Long-term records of growth and distribution of conifers: Integration of Paleoecology and Physiological Ecology. In *Ecophysiology of Coniferous Forests*, W.K. Smith and T.M. Hinckley, eds., Academic Press, New York, pp. 37-62.

Hughes, M.K. and L.J. **Graumlich**. 1996. Multimillennial dendroclimatic records from the western United States. In *Climatic Variations and Forcing Mechanisms of the last 2000 Years*, R.S. Bradley, P.D. Jones, and J. Jouzel. NATO Advanced Studies Workshop Series. Springer-Verlag.

Graumlich, L.J. and M. Ingram. 2000. Drought in the context of the last 1000+ years: some surprising implications. In *Drought: A Global Assessment*, D. Wilhite, ed., Routledge Press, New York.

Graumlich, L.J. 2000. Global change and wilderness areas: Disentangling natural and anthropogenic changes. In Proceedings: Wilderness Science in a Time of Change. Proc. RMRP=P-000. Ogden UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Center.

Graumlich, L.J., L.A. Waggoner and A.G. Bunn. 2005. Detecting Global Change at Alpine Treeline: Coupling Paleoecology with Contemporary Studies. In *Global Change and Mountain Regions: A State of Knowledge Overview* (Huber and Bugman, eds., Kluwer,).

Ramankutty, N., L. **Graumlich**, F. Achard, D. Alves, A. Chhabra, R. DeFries, J. Foley, H. Geist, R. Houghton, K.K. Goldewijk, E. Lambin, A. Millington, K. Rasmussen, R. Reid, and B.L. Turner II. In press. Global Land Cover Change: Recent Progress, Remaining Challenges, in *Land Use and Land Cover Change: Local Processes, Global Impacts*, edited by E. Lambin, and H. Geist, Springer Verlag, New York, forthcoming.

Costanza, R., Graumlich, L., and W. Steffan (eds.). Integrated history and future of people on earth. Boston, MIT Press, in review.

Presentations and Public Outreach:
Throughout my career, I have regularly presented papers at professional society meetings such as the American Geophysical Union and the Ecological Society of America. In addition, I seek out opportunities to speak to local citizen groups about my research in venues sponsored by NGOs (e.g., National Audubon Society, Greater Yellowstone Coalition) and by other museums (the Museum of the Rockies in Bozeman; the Draper Museum in Cody).

Grants And Contracts

Grants awarded while at The University of Arizona

National Science Foundation, Climatic Implications of Holocene Changes in the Mixed Conifer/Hardwood Forest, 1988-1990. $69,712.

Universities Space Research Association, University-based cooperative program in Earth System Science Education, 1990-1993. $76,363. (PI: Graumlich; Co-PIs: R.E. Dickinson, A. Huete, M.K. Hughes, J.T. Parrish, and S. Sorooshian)

National Science Foundation, Establishing the chronologic and climatic correlates of late Holocene cultural development in northwest and northern Alaska, 1991-1992. $53,732. (PI, S. Craig Gerlach, University of Alaska; Co-PI; Graumlich; note: Gerlach's scope of work reduced by funding agency and, as a result, PI/Co-PI status does not reflect level of effort or funding)

Western Regional Center, National Institute for Global Environmental Change, Interactive vegetation for climate models over the seasonal cycle, 1991-1992. $78,653 (PI: R.E. Dickinson; Co-PI: L.J. Graumlich)

National Park Service, Global Change Program, Tree-ring evidence of climatic variation and vegetation response, 1991-1997, $427,457 (PI: Graumlich; Co-PI: M.K. Hughes).

National Science Foundation, Climate Dynamics Program, Dendroclimatic Reconstruction For Western China Using Enhanced-Video Image Analysis, 1992-1995, $189,000. (Graumlich)

National Geographic Society, Dendroclimatic reconstruction for western China using enhanced-video image analysis, 1992-1994, $19450.

Western Regional Center, National Institute for Global Environmental Change, Interactive vegetation for climate models over the seasonal cycle, 1992-1993, $88,650 (PI: R.E. Dickinson; Co-PI: L.J. Graumlich)

National Science Foundation, Instrumentation and Laboratory Improvement Program, Undergraduate Laboratory Improvement for Earth System Science and Global Change, 1993-1995, $33,215 (PI: R. Bales; Co-PI: L.J. Graumlich)

National Park Service, Late Holocene Climatic Variation in Northwestern Alaska as Reconstructed From Tree Rings, 1993-1995, $94,017

National Science Foundation, Dynamics and history of treeline in the southern Sierra Nevada, 1994-1996, $9000 (Dissertation Improvement Grant for Andrea H. Lloyd).

National Science Foundation, Course and Curriculum Development Program, General Education Course Development for Earth System Science and Global Change, 1995-1997, $100,000 (PI: Graumlich; Co-PI: R. Bales, K. Hirschboeck, S. Leavitt)

InterAmerican Institute for Global Change Research, Vegetation History from Fossil Rodent Middens in Mid-Latitude American Deserts, 1996-1998, $206,419 (PI: Julio Betancourt; Co-PI: Vera Markgraf, L. Graumlich)

Competitive Grant Support from 1999 (arrival at MSU) onwards
Total funds awarded: %5,012,225

Research (* indicates Graumlich not PI)

USGS-Biological Research Division. Sierra Nevada Forest Dynamics: Pattern, Pace and Mechanism of Change, , 1999-2003, $140,454

*NASA, Monitoring Forest Response to Past and Future Global Change in Greater Yellowstone, (PI: A. Hansen, Co-I: Lisa Graumlich, Warren Cohen, Michael Lefsky), 2000-2002, $349,999

US Dept. of Agriculture NRI, Dynamics of Climate, Fire, and Land Use in the Greater Yellowstone Ecosystem, , 2000-2002, $65,000

Montana Space Grant Consortium, Assessing Sensitivity of Alpine Treeline, 2001-2003, $39,000

National Park Foundation, Canon National Park Scholars Program (support for Ph.D. student Andy Bunn), 2001-2004, $75,000

Department of Energy, Climatic Variations: Tree Ring Based Climate Reconstruction near the Fremont Glacier, Wind River Range, 2001-2002, $16,775

National Science Foundation, Earth System History Program, Precipitation variability in the Greater Yellowstone Region as inferred from 1000+ tree-ring records, 2000-2002, $239,000 plus $5000 Research Education for Undergraduate supplement.

USGS, Climatic Variation in Glacier National Park: Evaluating the Evidence for Decade to Centennial Variability in Climate, 2000-2001, $40,000

National Science Foundation, Biocomplexity in the Environment, Global Change, Globalization, and the Vulnerability of Mountain Systems, 2001-2003, $80,000

US Forest Service, Fire Management Strategies in Wilderness Areas 2001-2003, $91,914

National Science Foundation, The Big Sky Institute: Accessing and Understanding the Greater Yellowstone Ecosystem, 2002-2004, $17,216

US Agency for International Development, Managing National Parks in the Context of Changing Human Populations and Economies, 2003-2005, $171,861

*National Science Foundation, Effects of Mountain Resort Development on Water Quality: Importance of Spatial Location of Land use / Land Cover Change, 2005-2006, $34,297 (B. McGlynn, PI; Graumlich, Patten, Gardner and Shanley co-I)

*Department of Energy, Big Sky Regional Carbon Sequestration Partnership PHASE II, 2005-2009 (PI: S. Capalbo; BSI subcontract $501,463)

Education and Outreach

NASA Space Grant Program, TIMES-Teacher Integrating Math and Environmental Science, 2002-2004, $27,620

Montana Department of Fish, Wildlife, and Parks, Enhancing Wildlife Education, 2002-2003, $25,000

Lone Mountain Retreat: Anticipating the Role of Emerging Technologies in Science Education -- A Conference by NSTA and the Big Sky Institute of the University of Montana, June, 2004; 2004-2005, $63,243 (in collaboration with National Science Teachers Association)
US Environmental Protection Agency, Wildlife Education in Big Sky, 2004-2005, $41,765
National Science Foundation, Track 1, GK-12 Science and Society Fellows: Partnering with Rural Schools in the Greater Yellowstone Ecosystem, 2005-2007, $1,767,487
NOAA, Mountain Climate Workshop, 2005-2006, $10,040

Pending (under review; subtotal $3,895,715):
*National Science Foundation, Beyond Disciplines: Institutional Transformation at Montana State University, 2006-2009, $3,489,493
*National Science Foundation, Big Sky Leadership Initiative to ADVANCE Women into Careers in Research Leadership, 2006-2009, $299,222
National Science Foundation, A novel approach for improving records of long-term, multi-scale snowpack variability in Western North America, 2006-2007, $97,000
NOAA, Mountain Climate Workshop, 2006-2007, $10,000

Federal contracts and partnerships (subtotal $1,079,716):
National Park Service, Program Support for NPS, 2002-2006, $173,500
US Geological Survey, NBII Mountain Prairie Information Node Website and Base Operations, 2002-2006, $396,959
National Park Service, 7th Biennial Conference on Greater Yellowstone Ecosystem, 2003-2005, $13,075
US Geological Survey, Linking Long Term Local and Regional Records of Climate Variability, 2004-2005, $62,000
National Park Service, Monitoring Protocols for the Greater Yellowstone Network Inventory and Monitoring, 2004-2006, $130,221
National Park Service, Renovation of Northern Range Streams to Prevent ESA Listing of Yellowstone Cutthroat Trout, 2005-2006, $46,389
US Geological Survey, Regional Assessment of Historic Physical and Ecosystem Processes in the Northern Rockies, 2005-2006, $67,560
National Park Service, Monitoring Protocols, Inventory, 2005-2009, $185,500
National Park Service, Developing Strategies for Informal Education, Glacier National Park, 2004-2005, $4,512

Private funds for Big Sky Institute programs since 2002: $130,000

Thesis Advisor and Postgraduate–Scholar Sponsor
Undergraduate research projects in past 3 years): Lindsey Waggoner (Florida International University); Gabe Bellante (USFS); Brian Peters (USGS); Andra Toivola (Wildlife Conservation Society); Tim Sharac (Clarkson University); Sean Hill (Teach for America); Chris Caruso (UC Berkeley);

Graduate students: MaryBeth Keifer, Sequoia National Park; Ginger Burley, Yosemite National Park; Andrea Lloyd, Middlebury College; Gary Bolton, University of Arizona; Paul Sheppard, University of Arizona; Amy Hessl (University of West Virginia); Jeremy Littell (University of Washington); Andy Bunn (Woods Hole Research Center); Todd Kipfer (current); Greg Pederson (USGS); Kristin Gardner (current); Temuulen Tsagaan (Idaho State University)

Postgraduate Scholar: Michael Pisaric (Carleton University); Stephen Gray (USGS)

CURRICULUM VITAE

CONNIE A. WOODHOUSE

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as of Jan. 1, 2007
Department of Geography and Regional Development
409 Harvill Building, University of Arizona
Tucson, Arizona 85721-0076

EDUCATION

Ph.D. (December 1996) Department of Geosciences, The University of Arizona, Tucson, Arizona
MS (March 1989) Department of Geography, University of Utah, Salt Lake City, Utah
BA (May 1979) Prescott College, Prescott, Arizona

PROFESSIONAL POSITIONS

Associate Professor (Jan. 2007 - present), Department of Geography and Regional Development and Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ
Research Affiliate (Jan. 2007-Present), Institute of Arctic and Alpine Research, University of Colorado, Boulder. CO
Physical Scientist (Apr. 2000-Dec. 2006), Paleoclimatology Branch, NOAA National Climatic Data Center, Boulder, CO
Research Scientist III, Fellow (Mar. 2004-Dec. 2006), Institute of Arctic and Alpine Research, University of Colorado, Boulder
Adjunct Assistant Professor (Feb. 2001-Dec. 2006), Department of Geography, University of Colorado, Boulder, CO
Faculty Affiliate (2004-2008), Department of Civil Engineering, Colorado State University, Fort Collins, CO
Research Scientist II (Mar. 1999-Mar. 2004), Institute of Arctic and Alpine Research, University of Colorado, Boulder
Visiting Scientist (May 1998-Apr. 2000), Paleoclimatology Program, NOAA National Geophysical Data Center, Boulder, CO
Research Scientist I (Jul. 1997-Feb. 1999), Institute of Arctic and Alpine Research, University of Colorado, Boulder
National Research Council Associate (Jan. 1997- Apr. 1998), Paleoclimatology Program, NOAA National Geophysical Data Center, Boulder

AWARDS

Administrator's Award, National Oceanic and Atmospheric Administration (2006)
Bronze Award, Department of Commerce (2005)
National Research Council Fellowship, "Climate Reconstructions from Tree Rings in the Colorado Front Range," (Jan. 1997-April 1998)

Honorable Mention, Student Paper Competition, Association of American Geographers Climate Specialty Group (April 1997)
A.E. Douglass Graduate Scholarship (May 1995)
Graduate and Professional Student Council Award (March 1995)
Society of the Sigma Xi Award (March 1993)

RESEARCH GRANTS

NSF-ATM, Expanded and Lengthened Dendroclimatic Reconstructions of Great Plains Drought, $304,827, 04/01/98 - 03/31/01.

NSF-ESH, Temperature Variability since AD 1000 in the Western United States from Tree Rings, $52,782 (my part), 10/01/98 -09/30/01.

NSF-ESH, Collaborative Research: Reconstructions of Drought and Streamflow over the Coterminous United States from Tree Rings with extensions into Mexico and Canada, $35,674 (my part), 09/01/00 - 08/31/03.

NOAA Environmental Services Data and Information Management (ESDIM), Fire History Database, $82,000, 3/2003-12/2003.

NOAA Environmental Services Data and Information Management (ESDIM), Historical Climate Data Catalogue, $30,000, 3/2004 – 12/2004.

NOAA Office of Global Programs, Extended Hydroclimatic Records for the Upper Colorado River Basin, $154,515, 08/01/02 - 07/31/04.

US Geological Survey, Tree-Ring Chronologies from Remnant Collections, Western Colorado, $22,250, 4/05 - 12/05, $22, 250, 1/06 – 12/06.

Denver Water, Updates and Improvements of Tree-Ring Reconstructions of South Platte and Colorado River Streamflow, $28,000 6/03-7/05.

National Park Service, Riparian Forest Age Structure, Sand Creek Massacre NHS, $11,000, 09/05-10/06.

NSF- BCS - Geography and Regional Science, Climate and Woodland Expansion in the Western Great Plains, USA, $6,000 (my part), 9/1/04 - 8/31/06.

NOAA Office of Global Programs, 'Living' Blended North American Drought Reconstruction Grid, $40,000 (my part), 01/01/04 -12/31/06.

NOAA Office of Global Programs, A Multiproxy Paleofire Database, $93,000, 03/01/03 -02/28/06.

NOAA Office of Global Programs, Regional Integrate Sciences and Assessment, Western Water Assessment, $68,000 2/01/02-12/31/06.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Geophysical Union
American Meteorological Society
American Quaternary Society
Association of American Geographers
Tree-Ring Society

PROFESSIONAL ACTIVITIES

Presentations at conferences, workshops (2004-2006):

Woodhouse, C.A. 2006. Paleohydrologic records of streamflow: research to applications. Congreso Internacional de los Servicios Ecosistemicos en los Neotropics. Universidad Austral de Chile, Valdivia, Chile, November 13-17, 2006*

Woodhouse, C.A. 2006. San Juan climate over past centuries, Conference on Climate Change and Variability in the San Juan Mountains, Fort Lewis College, Durango, CO, Oct 11-12, 2006.*

Woodhouse, C.A. 2006. What the paleorecord tells us about drought in the United States: past and future. Managing Drought and Water Scarcity in Vulnerable Environment. Geological Society of America, Longmont, CO. Sept. 18-20, 2006.*

Woodhouse, C.A. 2006. The Science of Climate Variability: Paleoclimate. Joint Inter American Institute for Global Change Research and Advanced Study Program Colloquium, Policy Planning and Decision Making Involving Climate Change and Variability, National Center for Atmospheric Research, Boulder, CO, Sept. 11-22, 2006.*

Woodhouse, C.A. 2006. Utilizing Paleoclimatic Information: Challenges for Science and Management. American Quaternary Association, Biennial Meeting, Bozeman, MT, Aug 17-20, 2006.*

Woodhouse, C.A. 2006. Teaching with Real Data: Paleoclimatology Resources for Teachers Teaching Climate Change: Lessons from the Past, 2006 Workshop, Montana State University, Bozeman Mt, Aug. 14-15, 2006.*

Woodhouse, C.A. 2006. The Past Record of North American Drought, NOAA Climate Working Group Summer Retreat on Drought, Santa Fe, NM, July 1-Aug. 3, 2006.*

Woodhouse, C.A. 2006. Reconstructions of Past Streamflow from Tree-Ring Data, COMET Advanced Hydrologic Sciences Course, NCAR, Boulder, CO, June 29, 2006.

Woodhouse, C.A. 2006. Dendrohydrologic Applications to Colorado River Basin Water Resources Management. 7th International Conference on Dendrochronology, Beijing, June 10-17, 2006.

Woodhouse, C.A. 2006. Colorado drought, past and present. 22nd Pacific Climate Workshop, Asilomar, CA, March 26-29.*

Woodhouse, C.A. 2006. Tree-ring based reconstructions of streamflow: research to applications. Inter-America Institute of Global Change Research, Mendoza, Argentina, April 2-3.*

Woodhouse, C.A. 2006. Applications of Dendroclimatology to Water Resources Management. Concord (Climate Change – Organizing the Science for the American Cordillera), Mendoza, Argentina, April 4-6.*

Woodhouse, C.A., P.M. Brown, and M.K. Hughes. 2005. A 626-Year Summer Temperature Reconstruction for the Central Rocky Mountains. American Geophysical Union Fall Meeting, San Francisco, Dec. 5-9, 2005. PP11A-1428

Woodhouse, C.A., R.S. Webb, G. Garfin, and B. Udall. 2005. Hydroclimatic Reconstructions for Decision Support in the Colorado River Basin. U.S. Climate Change Science Program Workshop: Climate Science in Support of Decision Making, Arlington, VA, November 14-16, 2005.

Woodhouse, C.A. 2005. Drought, Tree Rings, and Water Resource Management. 3rd Annual New Mexico Drought Summit, Albuquerque, October 6, 2005.*

Woodhouse, C.A. 2005. Impacts of Drought: Water Resources in the Colorado River Basin. 3rd Solar Radiation and Climate Experiment (SORCE) Science Meeting, Durango, CO, September 14-16, 2005.*

Woodhouse, C.A.. R.S. Webb, J.J. Lukas. Droughts, Tree Rings, and Water Resource Management in Colorado Canadian Quaternary Association (CANQUA) 2005 Conference, Winnipeg, June 5-8, 2005.*

Woodhouse, C.A. A Paleo Perspective on Colorado River Flow. Geological Society of America, Rocky Mountain Section Annual Meeting, Grand Junction, CO, May 23, 2005.*

Woodhouse, C.A. and E.R. Cook. Spatial patterns of drought in North America from a gridded network

of tree-ring and instrumental PDSI data, 1557-1990. Predicting Drought on Seasonal to Decadal Time Scales Workshop, University of Maryland, College Park, MD, May 17-19, 2005.

Woodhouse, C.A.. R.S. Webb, J.J. Lukas. Graphical analysis of tree-ring reconstructions of annual streamflow. Planning Workshop to Develop Hydroclimatic Reconstructions for Decision Support in the Colorado River Basin, University of Arizona, Tucson AZ, May 4-5, 2005.

Woodhouse, C.A. International Multiproxy Paleofire Database. Fire History and Climate Synthesis in Western North American workshop, Flagstaff, AZ, April 30-May 3, 2005.*

Mock, C.J., M. Hartman, C.A. **Woodhouse**, A historical data catalogue. Association of American Geographers, annual meeting, Denver CO, April 5-9 2005.

Woodhouse, C.A., R.S. Webb, J.J. Lukas. An Updated and Expanded Tree-Ring Network for Hydroclimatic Reconstructions in Colorado. Association of American Geographers Annual Conference, Denver CO, April 5-9, 2005.*

Woodhouse, C.A., M.K. Hughes, and P.M.Brown. A 668-year temperature reconstruction for the central Rocky Mountains, USA. Inter-America Institute of Global Change Research, Akumal, Mexico, March 28-31, 2005*

Hartman, M. and C.A. **Woodhouse**, A fire history archive: the International Multiproxy Paleofire Database, MTNCLIM, Chico Hot Springs, MT, March 1-4, 2005.

Woodhouse, C.A. Paleoclimatic science in planning and decision making. American Geophysical Union Fall Meeting, San Francisco, Dec. 13-17, 2004. PP52A-07

Lukas, J.J., and C.A. **Woodhouse**. 2004. Refilling reservoirs after drought: what the tree-ring record says about high-flow years. Rocky Mountain Hydrologic Research Center annual meeting, University of Colorado, Nov. 5, 2004.

Woodhouse, C.A. Tree-ring analysis of winter climate variability and ENSO in California. Workshop on Historical Reconstructions of Climate Variability and Change in Mediterranean Regions. Bologna, Italy, Oct. 5-6, 2004.*

Woodhouse, C.A. Tree-ring reconstructions of streamflow in the upper Colorado River basin. Colorado Water Workshop, Western State College, Gunnison, CO, July 28-30, 2004.*

Woodhouse, C.A. Climate conditions during the Lewis and Clark Expedition as reconstructed from tree-ring data. The Nature of Lewis and Clark on the Great Plains Symposium, Nebraska City, NE, June 3-5, 2004.*

Woodhouse, C.A., Tree-ring evidence for late Holocene drought on the western Great Plains periphery. American Quaternary Association 18th Biennial Meeting, Lawrence KS, June 26-28, 2004*

Woodhouse, C.A. What can paleoclimate tell us about possible future changes in droughts and floods? Workshop on Climate Change and Water Utilities, NCAR, Boulder, March 15-16, 2004.*

Hartman, M, and C.A. **Woodhouse**, International Multiproxy Paleofire Database, Mountain Climate Sciences Symposium, Lake Tahoe, CA, May 2004.

Woodhouse, C.A. Application of Paleoclimatic Data to Drought Assessments. Workshop on Improving the Application of Science in Western Drought Management & Planning, Western Governors' Association, U.S. Geological Survey, International Boundary Water Commission, Tempe, March 11-12, 2004.*

Woodhouse, C.A., R.S. Webb, and J.J. Lukas. Applied Dendrochronology and Colorado Water Resource Management. Tree Rings and Climate: Sharpening the Focus. University of Arizona, Tucson, April 6-9, 2004.

Woodhouse, C.A. and R.S. Webb. 2004. Paleodrought reconstructions to planning. J2.1. 84th American Meteorological Meeting, Seattle, Jan. 11-15, 2004.*

Eakin, C. M., C. A. **Woodhouse**, E. R. Cook, R. R. Heim, Jr., Paleoclimatology: A New Tool in Drought Monitoring. 84th American Meteorological Meeting, Seattle, Jan. 11-15, 2004.

Webb, R.S. and C.A. **Woodhouse**. 2004. Ensemble Tree-Ring Reconstructions of Streamflow in the South Platte. J2.2. 84th American Meteorological Meeting, Seattle, Jan. 11-15, 2004.

* = invited

Invited talks, seminar series, general public presentations (2004-2006):

"Colorado climate: a paleo perspective." Natural Resource Ecology Laboratory Seminar Series, Colorado State University, Fort Collins, CO (Sept. 2006).
"Upper Rio Grande Streamflow Reconstructions from Tree Rings: Placing the Current Drought into a Long-Term Context." Water Lecture Series, New Mexico State University, Las Cruces, NM (Sept. 2006).
"Tree Rings and Past Flows on the Colorado River." Colorado River Roundtable meeting, Glenwood Springs, CO (August 2006).
"Dendrohydrology: Research to Applications." Noon Seminar Series, Institute of Arctic and Alpine Research, University of Colorado, (April 2006).
"Overview of Dendrochronology and Techniques for Tree-Ring Based Reconstructions of Streamflow." NRC Committee on the Scientific Bases of Colorado River Water Management, Salt Lake City (Oct. 31-Nov. 2, 2005)
"Paleoclimatic Information and Colorado River Basin Droughts." Technical Session, Association of California Water Agencies, 2005 Fall Conference, San Diego, CA (November 30, 2005)
"Tree-Ring Reconstructions and Colorado River Flow." Colorado Water Conservation Board, bimonthly meeting, Durango, CO (September 13, 2005)
"Tree-Ring Reconstructions and Colorado River Flow." Upper Colorado River Commission meeting, Farmington, NM (June 2005**)**
"Preliminary Streamflow Reconstructions for San Luis Valley Gages from Tree Rings." Rio Grande Water Conservation District, Quarterly Meeting, Alamosa, CO (April 2005)
Paleoenvironmental Archives as a source of Climate Information for Natural Resource Management: An Example from Tree Rings and Colorado Water Management" Managers Workshop at Mountain Climate Symposium (MTNCLIM) 2005. Chico Hot Springs, MT (March 2005)
"Colorado water management and tree rings: a progress report." Laboratory of Tree-Ring Research visiting lecturer series, University of Arizona, Tucson, AZ (Feb. 2005).
"Records of Past Streamflow Variability from Tree-Ring Data and Potential for the Upper Rio Grande River." Rio Grande Water Conservation District, Quarterly Meeting, Alamosa, CO (Oct. 2004)
"Tree-Rings, Drought, and Water Resource Management in Colorado." USGS Earth Surface Dynamics Group, Lakewood, CO (March 2004).

Other professional activities:

Tree-Ring Society, Vice President
International Tree-Ring Data Bank, chairperson of advisory board
International Multiproxy Paleofire Database, advisory board member
Board of Trustees, Rocky Mountain Hydrologic Research Center
Associate Editor, *Dendrochronologia*
Member, National Academy of Sciences, Committee on the Scientific Bases of Colorado River Basin Water Management
Peer reviewer for journal articles: *Arctic, Antarctic, and Alpine Research*, *Bulletin of the American Meteorological Society, Canadian Journal of Forest Research, Climatic Change, Climate Dynamics, Climate Research, Dendrochronologia, Earth Interactions, Earth Science Reviews, Journal of Climate, Ecology*, *Eos, Geology, Geophysical Research Letters, International Journal of Climatology*, *Journal of Geophysical Research – Atmospheres, Journal of the American Water Resources Association, Landscape Ecology, New Phytologist, Quaternary Research, Physical*

Geography, Science, The Holocene, *Tree-Ring Research*

Proposal reviews for National Science Foundation programs: Earth System History, Climate Dynamics, Ecosystems Studies, Geography and Regional Science; the Canadian Foundation for Climate and Atmospheric Sciences, Natural Sciences and Engineering Research Council of Canada, NOAA Climate Program Office (OGP), Water Research Program, University of Wyoming

PUBLICATIONS

Peer reviewed

Woodhouse, C.A. and J.J. Lukas, 2006. Drought, tree rings, and water resource management. *Canadian Water Resources Journal* 31, 297-310

Meko. D.M. and C.A. **Woodhouse**, in review. Dendroclimatology, dendrohydrology, and water resources management, In: Tree Rings and Climate: Sharpening the Focus, (eds. H.F. Diaz and M.K. Hughes). Kluwer/Springer.

Woodhouse, C.A., S.T. Gray, and D.M. Meko, 2006. Updated streamflow reconstructions for the Upper Colorado River basin. *Water Resources Research,* 42, W05415. doi:10.1029/2005WR004455.

Woodhouse, C.A. and J.J. Lukas. 2006. Multi-century tree-ring reconstructions of Colorado streamflow for water resource planning. *Climatic Change* DOI: 10.1007/s10584-006-9055-0.

Woodhouse, C.A., K.E. Kunkel, D.R. Easterling, and E.R. Cook. 2005. The 20th century pluvial in the western United States. *Geophysical Research Letters*, 32, dio:1029/2005GL022413

Meko, D.M. and C.A. **Woodhouse**. 2005. Tree-ring footprint of joint hydrologic drought in Sacramento and Upper Colorado River basins, western USA. *Journal of Hydrology*, 308, 196-213.

Pielke, R.A., N. Doesken, O. Bliss, T. Green, C. Chaffin, J.D. Salas, C.A. **Woodhouse**, J.J. Lukas, and K. Wolter. 2005. Drought 2002 in Colorado – An Unprecedented Drought or a Routine Drought? *Pure and Applied Geophysics (PAGEOPH),* 162, 1455-1479.

Cook, E.R., C.A. **Woodhouse**, C.M. Eakin, D.M. Meko, and D.W. Stahle. 2004. Long-term aridity changes in the western United States. *Science,* 306, 1015-1018.

Woodhouse, C.A., 2004. A Paleo Perspective on Hydroclimatic Variability in the Western United States. *Aquatic Sciences,* 66, 346-356.

Woodhouse, C.A. 2003. A 431-year reconstruction of western Colorado snowpack. *Journal of Climate*, 16, 1551-1561.

Woodhouse, C.A. 2003. Dendrochronological Evidence for Long-Term Hydroclimatic Variability. Lewis, W.M. Jr., Editor, *Water and Climate in the Western United States*, University Press of Colorado, Boulder, pp. 49-58.

Jain, S., C.A. **Woodhouse**, M.P.Hoerling. 2002. Multidecadal streamflow regimes in the interior western United States: implications for the vulnerability of water resources. *Geophysical Research Letters,* 29, 2036-2039.

Woodhouse, C.A., J.J. Lukas, and P.M. Brown. 2002. Drought in the western Great Plains, 1845-56: impacts and implications. *Bulletin of the American Meteorological Society* 83, 1485-1493.

Woodhouse, C.A. and P.M. Brown. 2001. Tree-ring evidence for Great Plains drought. *Tree-Ring Research*, 57, 89-103.

Woodhouse, C.A. 2001. A tree-ring reconstruction of streamflow for the Colorado Front Range. *Journal of the American Water Resources Association* 37, 561-570

Woodhouse, C.A. 1999. Artificial neural networks and dendroclimatic reconstructions: an example from the Front Range, Colorado, USA. *The Holocene* 9: 521-529.

Woodhouse, C.A. and J.T. Overpeck. 1998. 2000 years of drought variability in the central United States. *Bulletin of the American Meteorological Society* 79: 2693-2714.

Woodhouse, C.A. and D.M. Meko. 1997. Number of precipitation days reconstructed from southwestern

tree rings. *Journal of Climate* 10:2663-2669.

Woodhouse, C.A.1997. Tree-ring reconstructions of circulation indices. *Climate Research* 8:117-127.

Woodhouse, C.A. 1997. Winter climate and atmospheric circulation patterns in the Sonoran Desert region. *International Journal of Climate* 17:859-873.

Hirschboeck, K.K., F. Ni, M.L. Wood, C.A. **Woodhouse**, 1996. Synoptic dendroclimatology: overview and outlook. In: J.S. Dean, D.M. Meko, and T.W. Swetnam, eds., *Tree Rings, Environment, and Humanity*. Radiocarbon, Tucson, Arizona, pp. 205-223.

Schuster, W.S.F., J.B. Mitton, D.K. Yamaguchi, and C.A. **Woodhouse**. 1995. A comparison of limber pine (*Pinus flexilus*) ages at lower and upper treeline sites east of the Continental Divide in Colorado. *American Midlands Naturalist* 133:101-111.

Woodhouse, C.A. 1993. Tree-growth response to ENSO events in the central Colorado Front Range. *Physical Geography* 14:417-435.

Woodhouse, C.A. and P.A. Kay. 1990. The use of tree-ring chronologies to show spatial and temporal changes in an air mass boundary. *Physical Geography* 11:172-190.

Selected non-peer reviewed publications

Woodhouse, C.A. 2006. Tree-ring analysis of winter climate variability and ENSO in Mediterranean California. Il Nuovo Cimento, 29, 1-8.

Woodhouse, C.A. 2005. Colorado River Basin Climate, Paleoclimate Overview. In: Special Publication for Association of California Water Agencies and Colorado River Water Users Association Conferences, California Department of Water Resources, November 2005, pp. 7-13

Anderson, D.M., and C.A. **Woodhouse**, 2005: Climate change: let all the voices be heard (News and Views). Nature, 433 (7026), 587-588 (10 Feb 2005)

Woodhouse, C.A., Lukas, J.J., Webb, R.S. 2003. The tree-ring record of drought in Colorado over the past 300-460 years. Colorado Drought Conference: Managing Water Supply and Demand in Times of Drought, Conference Proceedings, Colorado Water Resources Institute Information Series Report N. 96, Colorado State University, pp. 10-14.

Lukas, J.J., **Woodhouse**, C.A., Webb, R.S. 2003. The TREEFLOW Project: applications of tree-ring data to sustainable water management in Colorado. Colorado Water, Newsletter of the Water Center of Colorado State University, December 2003, pp. 28-30.

Woodhouse, C.A. 2003. Droughts of the past: implications for the future? In: S. Smith, ed., *The Future of the Southern Plains*. University of Oklahoma Press, pp. 95-113.

Woodhouse, C.A., and Meko, D.M. 2002. Introduction to tree-ring based streamflow reconstructions. *Southwest Hydrology* 1, 14-15.

Woodhouse, C.A. and Meko, D.M. 2001. Dendrohydrologic reconstructions: applications to water resource management. *12th Symposium on Global Change and Climate Variations Preprint Volume*, American Meteorological Society, Boston, pp. 161-164.

Woodhouse, C.A. W.S. Gross, J. Keltner, and E.P. Gille. 2000. Distributing Paleoclimatic Data. *Earth System Monitor* 10: 6-7.

Woodhouse, C.A. 2000. Extending hydrologic records with tree rings. *Water Resources Impact* 2:25-27.

Woodhouse, C.A. and J.T. Overpeck. 1999.A 2,000 year paleoclimatic record of drought variability in the central United States. *Tenth Symposium on Global Change Preprint Volume*, 11-15 January 1999. American Meteorological Society, Boston, pp. 309-312.

Woodhouse, C.A. , J.T. Overpeck, T.R. Karl, and N.B. Guttman. 1998. New database of North American paleodrought. *Earth System Monitor* 8: 1-6.

GRADUATE STUDENT COMMITTEES

Erika Wise, University of Arizona, Geography and Regional Development
Stephanie McAfee, University of Arizona, Geosciences
Karen Eisenhart, University of Colorado, Geography
Zeyad Tarawneh, Colorado State University, Civil Engineering
Shelly Rayback, University of Texas (Austin), Geography

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U.S. GEOLOGICAL SURVEY

RESEARCH SCIENTIST RECORD

1. NAME**: Julio L. Betancourt**

2. DATE PREPARED: February 2003 **(Partially updated to 2005)**

3. DUTY STATION: BRR, WRD, WR, Desert Laboratory, USGS-WRD, 1675 West Anklam Rd., Tucson, AZ 85745; (602) 670-6821 (x 107), FAX (602) 670-6806; jlbetanc@usgs.gov, Web page: http://wwwpaztcn.wr.usgs.gov/julio_cv.html (some reprints as downloadable pdf files).

4. REGION/RESEARCH DISCIPLINE: Western Region, Ecology

5. CLASSIFICATION TITLE, SERIES, AND GRADE: Research Hydrologist ST-16

6. DATE OF ENTRANCE ON DUTY: July 1980 as Minority Participation in the Earth Sciences Student

7. DATE OF LAST PROMOTION: ST-16 February 2004

8. DATE OF LAST RESEARCH GRADE PANEL REVIEW: April 2003

9. EDUCATION:

Ph.D. In Geosciences, minor in Ecology and Evolutionary Biology, University of Arizona, Dec. 1989.
M.S. in Geosciences, minor in Ecology and Evolutionary Biology, University of Arizona, May 1983.
B.A. in Anthropology, minor in Geography, University of Texas, Austin, May 1975.

10. TECHNICAL TRAINING RECEIVED: None

11. PROFESSIONAL EXPERIENCE

- PRESENT ASSIGNMENT: I am currently a Project Chief in the National Research Program and adjunct faculty in two departments, Geosciences and Geography, at the University of Arizona. I am based at the University of Arizona's Desert Laboratory on Tumamoc Hill, an ecological reserve with a 98-yr research legacy.

  DATES: From: Jan. 1989 to Present

  As Project Chief, I develop the research questions, raise external funds, and do most of the field research and a significant part of the laboratory work myself. For the past decade, the Project has included a 1/3 time computer tech, a 1/3 time administrative assistant, a full-time technician (term appointment until March 1999, permanent since then). In the last 5 years, it also included a GS-12

plant ecologist. My major source of funding has been WRD's National Research Program (NRP), though external funds contribute significantly to the project's activities, to collaboration with other scientists in government and academia, and to the heavy involvement of postdocs, graduate and undergraduate students in my research. My grantsmanship has been abetted by co-location at the University of Arizona's Desert Laboratory. Since my last RGE review in spring 2000, I have relied on the following grants and contracts to supplement base funding from NRP:

Navajo Nation, 6/02-12/03 ($27.5K), with Jay Quade, Jon Patchett and grad student Amanda Reynolds (U. of Arizona) Use of radiogenic isotopes to determine provenance of archeological materials and to study influence of atmospheric dust on soil formation and fertility.

NSF-EAR, 9/02-8/04 ($178K), with Jay Quade and Mathias Vuille (U. Mass.) "Past and modern variability of summer and winter rainfall on the Pacific slope of the central Andes"

NSF-EAR 9904838, 8/1/99 to 7/30/01 ($258K), J. Betancourt and Jay Quade (Univ. of Arizona) "Paleoenvironmental change in the Atacama Desert during late Quaternary: Evidence from middens and paleosprings"

National Park Service & Navajo Nation, 3/1/00 to 10/00 ($20K), J. Betancourt (USGS), Jay Quade, Jeff Dean & Nathan English (Univ. of Arizona), Use of $^{87}Sr/^{86}Sr$ to source architectural timber at Chaco Canyon National Cultural Historical Park, New Mexico"

NSF-DEB 9815500, 6/98-9/00 ($350K), Steve Jackson (U. of Wyoming) and J. L. Betancourt (USGS & Univ. of Arizona), "Late Holocene expansion of Utah juniper in Wyoming: A model system for studying the ecology of natural invasions"

DESCRIPTION OF PROJECT: The main objective of my research is to study ecosystem and watershed responses to climate variability on different temporal and spatial scales. More often than not, these responses can only be studied and understood in retrospect and at regional to subcontinental scales. Hence, much of my research is observational and relies on historical evidence; ultimate success depends on developing and contributing to networks of sites and data that can be synthesized at regional scales, and in some cases, globally. Retrospective studies call for development, refinement and calibration of new methods and approaches. History presents opportunities for natural experiments of important phenomena, for example how ENSO modulates the pulse of fires and floods across the regional landscape, how natural vegetation responds to CO_2 enrichment over the long term, and what are the ecological, hydrological and socioeconomic consequences of wildfires, plant invasions and regional droughts.

Historical studies may be the only way we can discriminate between natural and cultural causes of change, which is one of the great challenges facing environmental science in the 21st Century. It is neither possible nor wise to assess man's role in arroyo cutting, changing flood and fire frequency, shrub and tree encroachment of grasslands, and ultimately, global change, without historical context. Likewise, historical perspective is essential for gauging nature's impact on society- what is the historical range of natural variability for phenomena (e.g., drought) that affect risks from hazards and the relative success of resource and ecosystem management? In two decades worth of activities, I have addressed, to some degree, all of these issues.

My close colleagues, students and I have contributed to networks of rodent midden and tree-ring data in the Americas. We have designed, tested and/or applied a wide variety of approaches, including historical documents and photographs, instrumental hydrological and

climatic data, long-term vegetation plots, tree rings, stable isotopes, ancient DNA, biometrical measurements, alluvial stratigraphy, and even ice cores to reconstruct the past. We have always made a point of applying this historical knowledge not only to fundamental questions of science, but also to contemporary issues facing management of water and other resources.

PREVIOUS PROFESSIONAL POSITIONS**:**

1989-Present: Project Chief, Research Project Office, WRD, WR, Tucson.

1989-Present: Adjunct Associate Professor, Dept. of Geosciences, U. of Arizona.

2001-Present: Adjunct Associate Professor, Dept. of Geography, U. of Arizona

1992-1998: Assistant Research Advisor (1992-1995) Research Advisor (1995-1998), Ecology Discipline, National Research Program, WRD, USGS. Duties included summarizing and promoting ecological research within the agency, chairing peer review panels, and making recommendations for individual project funds. The Ecology group includes 21 projects ranging from plankton dynamics in tidal estuaries to microbial geochemical modelling, an overall staff of about 100 scientists and support personnel, and average appropriated funding level of ca. $4-5 million/yr.

12. SIGNIFICANT RESEARCH ACCOMPLISHMENTS (written in 2003; not updated):

In synthesizing my career accomplishments, I would like to start with the last few hundred years and work my way back to the last 40,000. I'll try to use earlier studies to set up my current productivity, which amounts to 35 papers published over the last five years. From the onset, I apologize for the excess prose, but I have eclectic interests that require some explanation, particularly how one recognizes and exploits scientific opportunities.

One of my primary interests is in modern climate variability and its effect on physical and biological systems, particularly in the Southwestern U.S., where I've lived and worked since the mid-1970s. This interest came into sharp focus during the extreme 1982-1983 El Niño. Southern Arizona had become persistently wet beginning in 1976 ending a relatively dry spell since the 1940s. In the 1983 water year, I took note of the fact there were large floods but few fires. In October, the Santa Cruz River in Tucson registered double the previously estimated 100-yr flood, and flood damages in southern Arizona totaled half a billion dollars. A few years later, I came face-to-face with the extreme 1988-1989 La Niña. At the time, I lived up against Coronado National Forest in the Catalina Mountains. It didn't rain from February to August and July temperatures rose sky high. I watched a third of the standing chaparral biomass on my property die back in a matter of a few weeks, and similar dieoffs occurred across the Southwest and northern Mexico. I stayed up at night worrying about fire, and thinking about climate. I've always been a sucker for the obvious, so in the years that followed I geared up to test the following hypothesis. Many phenomena, from fires to floods to pulses in plant establishment and mortality are not only driven, but also synchronized across the Southwest by interannual and decadal-scale variability in ocean temperatures. It would take some innovation, but if I could document this, there would be several potential applications in fire and floodplain management, and possibly some fundamental insights for landscape ecology.

In 1988, at the invitation of Dan Cayan, Bob Webb (USGS) and I hid out for a week at Scripps

and wrote a lengthy monograph on the effects of climate variability on flood frequency and magnitude on the Santa Cruz River (Webb and Betancourt 1990, 1992). Essentially, we were challenging traditional assumptions of nonstationarity in flood frequency analysis, at least for southern Arizona. It started out with the observation that the seasonality of annual flood peaks in the Santa Cruz River varied through the last century in a conspicuous way, with cool season floods and higher annual flood peaks prevalent in the early and latter third of the century, and the relatively dry middle of the century dominated by summer (July-August) floods. We reasoned that non-summer and more extreme floods happened most frequently during El Niño events. We also argued that decadal-scale variability in Pacific climate not only modulated the frequency of El Niño events, but also the seasonality and magnitudes of annual flood peaks in the Santa Cruz River. From flood frequency behavior related to climate, we guessed right at the pattern that is now recognized as the Pacific Decadal Oscillation or PDO. At least for the Santa Cruz River, the assumption of nonstationarity is violated for traditional ways of estimating flood frequency for regulatory and design purposes.

Interannual and decadal-scale variability should also affect other phenomena such as fire frequency and extent, and I happened to have a close colleague and best friend, Tom Swetnam (now Director of Tree-Ring Lab in Tucson), who was a fire ecologist. Swetnam and I digitized fire statistics of annual area burned in the 20th century from Region 3 of the National Forests (Arizona & New Mexico). To extend the record, we then developed a proxy for annual area burned using the fire-scar tree-ring record for the last 300 years for over 60 sites in the region. Annual area burned nicely tracked the winter Southern Oscillation Index, and the fire-scar record was the opposite image of precipitation series reconstructed from tree rings (Swetnam and Betancourt 1990, Swetnam and Betancourt 1992). Fire activity is well synchronized by Pacific climate across the Southwest. As much as 6 to 9 months in advance, depending on data from TAO moorings in the equatorial Pacific, a developing El Niño (La Niña) could be used to predict a wet (dry) spring and a mild (severe) fire season. At least for Region 3, fire managers could either prepare months in advance for a bad fire season, or start scheduling prescribed burns well ahead of a mild one. A few years later, we showed that similar, well-synchronized patterns correlated to Pacific climate applied to outbreaks of forest insects and demographic surges in tree recruitment and mortality. The probabilities of such ecological disturbances were also modulated by decadal-scale climate variability (Swetnam and Betancourt 1998). Ecologists took notice of the implications, and in summer of 2001 jointly awarded us the Ecological Society of America's William S. Cooper Award.

Most recently, I teamed up with colleagues at the University of Wyoming to examine multidecadal (40-70 yr) oscillations in drought-sensitive 750-yr long tree-ring chronologies across the central and southern Rockies (Gray et al. 2003). Wavelet analyses of these time series show that strong multidecadal periodicities are unstable in time and space. They're neither cyclical nor always synchronized. Occasionally, particularly around megadroughts such as the late 16th century and 1950s, however, these multidecadal periodicities become synchronized from Montana to New Mexico. These subcontinental-scale droughts may be the result of different seasonal precipitation regimes (winter, May-June, and July-August) failing simultaneously in multiple years. The last time this happened was during the 1950s, when the tropical Pacific turned persistently cold at the same time as the North Atlantic warmed. A similar change in ocean temperatures in the late 1990s could explain the current 5-yr drought, which could represent the early stages of another megadrought. In FY 2003, I tried to make sure that this message doesn't fall through the cracks by giving frequent public talks on the history and prospects of megadrought in the western U.S. The tendency for megadroughts such as that of the late 16th century to initiate multidecadal periodicities in precipitation, ecological disturbances and demographic trends suggests a powerful mechanism for broad-scale vegetation change. In the central and southern Rockies, greater awareness of geographically coherent, multidecadal oscillations should affect how in the future we might manage water resources, flood hazards, wildland and prescribed fires, timber production, carbon sequestering, and both non-native and native plant invasions in the face of global change.

A great deal of my career has been devoted to exploiting the full potential of fossil rodent middens as a unique source of paleoenvironmental information. My first midden study was at Chaco Canyon, New Mexico, and two decades later it inspired another related study with potentially broad implications. The story is worth retelling, if not just to explain one of my current research activities. I first visited Chaco Canyon and its impressive ruins as a tourist in November 1975. The two most popular questions asked by thousands of tourists that visit Chaco Canyon each year are "Where is the bathroom?" and "Where did the prehistoric Anasazi get the wood?" On that first visit, I myself pondered the second question while overlooking the Great House of Pueblo Bonito from the cliff above. Here's what went through my mind. Chaco Canyon is a desolate, treeless landscape in the middle of the San Juan Basin. Between A.D. 900 to 1150, the Anasazi incorporated over 200,000 timbers in the architecture of Chaco Canyon, mostly ponderosa pine but also other tall conifers. The San Juan Basin is cold and windy in winter, so never mind the timber- where did they get the fuelwood to last the winter? At ~1900 m in elevation, Chaco Canyon wasn't high enough to support ponderosa pine or mixed-conifer forests, but where was the pinyon-juniper woodland prevalent at similar elevations elsewhere in the San Juan Basin?

Four years later, when I learned about packrat middens and looked for a site to get started, Chaco Canyon naturally came to mind. My first midden study was published in *Science* (Betancourt and Van Devender 1981) and reported that between AD 900 to 1150, the prehistoric Anasazi had wiped out the local pinyon-juniper woodland that has supplied the fuelwood. The tall conifers that supplied the architectural timber did not grow in abundance in prehistoric Chaco and had to come from more than 75 km away. Mike Samuels and I later developed a computer model to simulate the natural demography of the Chaco Canyon woodland vs. the impact of fuelwood harvesting over two centuries. In all but the most optimistic cases, the woodland gave way (Samuels and Betancourt 1982). To spend down leftover funds from a National Geographic grant, I logged many hours on a scanning electron microscope, identifying architectural wood from Pueblo Bonito and the other Great Houses. Ponderosa pine accounted for most of the wood, but at least a quarter of the architectural timber was spruce or fir (Betancourt et al. 1985). These boreal species had to hauled from isolated mountaintops 75-100 km away. Exactly which mountain range might tell us something about Chaco Anasazi social and economic relationships across the region, but would remain a mystery for another fifteen years.

For a variety of reasons, the logger mystery happened to come across my radar screen again in 1999, when a former colleague sent me a related paper that he and Howard Taylor (USGS) had published on using trace elements to determine the provenance of the Chaco timbers. The results were ambiguous, in part because different tree species tend to take up and translocate trace elements differentially. According to my close colleague at the Desert Lab, Jay Quade, this could be avoided by using radiogenic isotopes that are not biologically fractionated. I made a few phone calls and raised $20K from old archeologist friends now working for the National Park Service and the Navajo Nation. We hired one of Quade's former students, Nathan English, and picked strontium isotopes to get started. Sr isotopes, and the mountain ranges that surround Chaco Canyon, both vary by composition and age of the dominant bedrock. The underlying philosophy is that trees assimilate Sr from local soils and atmospheric dust, and incorporate them into wood without fractionating the isotopes ^{87}Sr and ^{86}Sr. The $^{87}Sr/^{86}Sr$ ratio in the wood should reflect the ratio in local soil water, which should be some combination of local weathering products and atmospheric dust that settles on tree canopies. Indeed, in a regional survey, we found that $^{87}Sr/^{86}Sr$ ratios do not differ by species of tree, but each mountain had a different strontium ratio, much like every person has a unique fingerprint. Two-thirds of the Chaco timber could be traced to the Chuska Mountains to west, one-third to the San Mateo Mountains to the south, and none at all to the San Pedro

Mountains to the east. The two fingerprinted sources were both logged as early as A.D. 974, suggesting that selection of timber sources was driven more by socioeconomic ties with communities to the west and south than by timber depletion with distance and time (English et al. 2001).

So what are we doing now with Sr isotopes that started on my first visit to Chaco in 1975? Well, one thing led to another and I realized that Sr isotopes in plants could be used to study a host of other biogeochemical processes. By sampling tree populations at closer spacing, we are trying to define more precisely the scales of geographic variation in $^{87}Sr/^{86}Sr$ ratios from atmospheric dust in the San Juan Basin and adjoining areas. We are using Sr isotopes to quantify the importance of atmospheric dust as a source of mineral nutrients in San Juan Basin ecosystems by analyzing tissue from plants with different life histories and strategies (annual grasses, shrubs and conifers) growing on a variety of substrates. And we are applying this knowledge to understanding weathering rates and processes in the Four Corners region. Needless to say, I have a lot of respect for the serendipidity of science.

Most of my early midden efforts, and those of my colleagues are synthesized in Betancourt et al (1990). Since then, I have continued to generate the staple of the science, which are individual midden chronologies for key areas in western North America, from southern New Mexico (Betancourt et al. 2000) to southern Montana (Lyford et al. 2002). At last count, we had dated and analyzed more than 2000 middens from North America. Here are some examples of what we know and where we are headed. During the last glacial, desert vegetation was restricted to a few areas below 300 m in Death Valley and around the Gulf of California; pinyon-juniper-oak woodlands covered large expanses between 300 and 1700 m in the Southwest; mixed-conifer woodlands & forests dominated rocky terrain above 1400m in the Colorado Plateau and Great Basin; spruce-fir (boreal) forests covered elevations above 2000 m, and ponderosa pine was surprisingly restricted to south of 35ºN (south of Albuquerque & Flagstaff). We can ascertain these facts with great taxonomic (unlike pollen studies, which are taxonomically coarse), temporal (± 100 yrs), and spatial (±100 m) resolution to the point, in fact, where we can constrain Pleistocene hybrid zones, say between two different pinyon species, within a few kilometers. Some of the most interesting work remains to be done. For example, what were the specific dynamics involved in Holocene plant migration, and to what extent can we use this information to understand ongoing and future native and non-native biological invasions? Analysis of past migrations using paleoecological data can reveal patterns and processes unseen in studies of invasions that span only the past few decades. In a topographically complex landscape such as the western U.S., what where the roles of landscape structure and climate variability in dictating the pathways and pace of migration?

Paleoecological studies of plant invasions require spatial networks of time-series data that record local establishment and expansion of populations. This means large field crews, experienced technicians, mutiple years, and large sums of money. During the past 5 years, my colleague Steve Jackson (University of Wyoming) and I, along with our students, have conducted two such, synoptic studies involving migration of Utah juniper and ponderosa pine into the central Rockies during the last few thousand years. The Utah juniper project is now done and we have completed the first few publications (Lyford et al, 2002, 2003; Jackson et al. 2002). The ponderosa project is nearing completion, and its migrational history parallels that of Utah juniper. For Utah juniper, Holocene migration into central and northern Wyoming and southern Montana from the south proceeded by a series of long-distance dispersal events, which were indeed paced by climate variability and structured by the geographic distribution and connectivity of suitable habitats on the landscape. The migration of Utah juniper into the region involved multiple long-distance dispersal events, ranging from 30 to 135 kilometers. One of the earliest-established populations, on East Pryor Mountain in south-central Montana, is currently the northernmost population of the species. Establishment by long-distance dispersal of that population and another in the Bighorn Basin occurred during a period of relatively dry climate between 7500 and 5400 years ago. Further expansion of these initial colonizing populations and backfilling to occupy suitable sites to the south was delayed during a wet period from 5400 to 2800 years ago. Development of dry conditions 2800 years ago led to a rapid expansion in which Utah juniper colonized sites throughout its current range. Apparently, landscape

structure and climate variability do play important roles in governing the pattern and pace of natural invasions, and deserve close attention in studying and modeling plant invasions, whether exotic or natural. The latest ecological models of plant invasion generally ignore these two factors.

In effect, Jackson and I have generated a migrational chronosequence for two of the most widespread and dominant species in the western U.S. that can now be exploited for interdisciplinary studies tied to one central question. To what extent are population, community and ecosystem properties (e.g., genetic distance from source populations, biodiversity, heterogeneity of soil resources, erosion potential, etc.) a function of time since arrival of the dominant plant species? As indication of things to come, one of my close colleagues, Jim Cane from the USDA Bee Lab in Logan, Utah, recently used my migrational chronosequence for creosote bush to show a linear relationship (r^2= 0.92) between the ratios of about 100 specialist/generalist bee pollinators and time since creosote bush arrival (100 to 21,000 years). There's more to come.

A side benefit of the packrat midden work has been the accumulation of a rich archive of plant and animal remains identified to species and spanning one of the most dramatic transitions in the geologic record. Between 15,000 and 12,000 cal yr B.P., atmospheric CO_2 concentrations increased by 30%, land temperatures increased by 5-10ºC, seasonal precipitation regimes shifted, and there were broadscale changes in biotic distributions. In the course of my career, I have taken full advantage of this rich archive by conducting a variety of morphological, geochemical and molecular analyses to develop unique insights about evolutionary and ecological responses to global change.

For example, two characteristics of plant gas exchange and water relations that are quantifiable by measurement in modern and ancient plant leaves are stomatal density and stable isotope variations. These parameters are sensitive to changes in climate as well as atmospheric CO_2 levels, such as have occurred since industrialization (280 ppmv to 360 ppmv), and during the last deglaciation (200 to 280 ppmv). To evaluate ecophysiological responses to environmental variability, a group led by Steve Leavitt (Univ. of Arizona) and I have measured stomatal density and stable isotopes (δD, $\delta 0^{18}$, & $\delta^{13}C$) across individuals, across environmental gradients, and through time in modern populations, time series of herbarium specimens, and fossil leaves of species with different life histories and photosynthetic pathways (C_3, C_4 and CAM)(Van de Water et al 1994, Shanley et al 1997, Pendall et al 1999, Pedicino et al. 2002, Van de Water et al 2002, Telwilliger et al 2002). We have also expanded the isotopic work to fossil tooth enamel of extinct herbivores to reconstruct late glacial diet, vegetation and monsoonal climate in the USA-Mexico borderlands (Connin et al 1998). In the course of these studies, we have generated a rich database of >5000 isotopic and >2500 stomatal density determinations, which is now being mined by the scientific community for modeling studies.

There are many take-home messages from this body of work. For example, plants responded to CO_2 enrichment during deglaciation by reducing stomatal density and increasing water use efficiency (WUE) (Van de Water et al 1994). These savings in WUE, however, were not enough to offset increasing aridity, so Holocene deserts quickly replaced Pleistocene woodlands. At some threshold in effective moisture, climate trumps direct CO_2 effects on vegetation dynamics (Betancourt 1996). On another front, we found a clear inflection point in $\delta^{13}C$ trends with elevation and precipitation. The inflection occurs at ~500 mm mean annual rainfall and coincides with the pedalfer-pedocal boundary, the point at which Ca either accumulates as carbonate or is leached into the vadose zone. Above this threshold, soils are commonly at field capacity during summer, there is less cavitation in plant xylem, and environmental variables other than effective moisture affect isotopic discrimination (Van de Water et al 2002). On a less positive note, our large dataset exhibits enough unexplained variability at the individual and population level to suggest that isotopes are a very imperfect proxy for more direct measurement of ecophysiological performance. At the moment, easy access to mass spectrometers seems to be driving routine use of isotopes in modern plant studies, with little regard to sample sizes needed to evaluate significance of patterns and trends. Based on another large dataset from San Francisco Bay, Cloern et al. (2002; http://aslo.org/lo/toc/vol_47/issue_3/0713.pdf) has made a similar observation about the use of plant

isotopes as tracers in estuaries. Thus far, these cautionary tales are being disregarded by most researchers.

In the early 1990s, Felisa Smith, a new post-doc in Jim Brown's lab at the Univ. of New Mexico, expressed interest in working with fossil middens. I sent her a plane ticket to Tucson and we hatched a project in a matter of days. For her dissertation, Felisa had studied body size and nutritional ecology of modern packrats. Among other things, she had discovered that packrat body size, which is heavily influenced by environmental temperature (Bergmann's Rule), explains >70% of the variance in fecal pellet diameter. "Have I got a *Science* paper for you," I told Felisa on the ride from the airport to the Desert Lab. Large statistically-robust samples of fecal pellets are available in middens. At hand was the opportunity to secure quantitative measures of the magnitude and rates of genetic change (versus phenotypic plasticity) associated with the evolution of a basic determinant of physiology, ecology and behavior- that is, body size. In our first paper, we inferred a 6ºC warming from body size changes in *Neotoma cinerea* during the last deglaciation (Smith et al 1995). Here's what one of the reviewers had to say, "Who would guess that one might begin with little more than rat turds and end up with one of the strongest cases yet for the historical influence of climatic change on the evolution of one of the most fundamental determinants of life processes (i.e., body size).... to my mind there is something wonderfully satisfying in clever people getting so much good science out of old piles of rat dung!" Felisa and I continue our collaboration on the ecological and evolutionary dynamics of packrats in the last 40,000 years, with an eye towards predicting mammalian responses to future global change (Smith and Betancourt 1998, Smith and Betancourt 2003).

In the mid to late 1990s, I mentored a Univ. of Nevada-Las Vegas graduate student, Kim Hunter, in her dissertation work on the genetics of North American creosotebush, a plant that generally exhibits a classic and much discussed gradient of diploidy in the Chihuahuan Desert, tetraploidy in the Sonoran and hexaploidy in the Mojave. One day Kim called me up, desperate that she couldn't get PCR amplifications to work and was thus unable to discriminate the different ploidy populations genetically. I couldn't resolve her technical problems, but suggested that she instead measure guard cell size in stomates. With increasing ploidy level, guard cells should increase in size with increasing amounts of DNA. I had an ulterior motive in mind. If I was right, we could probably map the geographic distribution of ploidy races of creosotebush in northern Mexico and the southwestern U.S. since full-glacial times, simply by measuring guard cells in fossil leaves. Kim eventually conducted a greenhouse experiment where she germinated creosotebush seed from numerous populations and determined in fact that guard cell size was an excellent measure of ploidy level. She and I went on to show that the higher ploidy races had not evolved with Holocene migration from Mexico into the Southwestern U.S., as previously thought, but rather were already present during the last glacial and simply reorganized their distributions after deglaciation (Hunter et al. 2001). One moral to this story is that populations, and not whole species, migrate. Modeling the response of creosote bush to climate change would produce quite different outcomes by simply changing the unit of analysis from the whole species to the individual genotype (i.e., ploidy race).

In recent years, I have worked steadily to exploit ancient DNA analyses in what is possibly the richest store of ideally-preserved plant and animal tissue in the world. In collaboration with one lab at Wayne State, PCR amplifications were attempted for five plant taxa using both fresh and material dried for different times, from 2 months to 40,000 years. Verifiable results could not be obtained from samples older than 3500 years (Golenberg et al., ms. in review). PCR amplification of the DNA is apparently blocked by cross-links between reducing sugars and amino groups. These cross-links are generally the product of Maillard reactions, a series of condensation reactions that bind proteins and carbohydrates in long-term preservation of plant and animal tissue. Such cross-links can be cleaved by the chemical reagent, N-phenacylthiazolium bromide (PTB). In collaboration with another genetic lab at Max-Planck Institute, use of this reagent permitted successful amplification of both mitochondrial and chloroplast DNA in >10,000 yr old material from rodent middens in Chile and Argentina (Kuch et al. 2002; Hofreiter et al. 2003). Ultimately, this capability could provide a time-lapse view of molecular diversification

associated with datable range shifts, and a set of empirical tests for the analytical methodology and conceptual framework that population geneticists use to infer population history.

One of the principal challenges in my career has been to keep looking over the horizon for novel opportunities. For example, we've known for some time that animals other than packrats produce identical deposits in practically every other arid and semi-arid region of the world (Betancourt et al. 1990; Pearson and Betancourt 2002). The midden potential outside of North America, however, has been slow to develop. Part of the problem is that none of the scientists who played key roles in developing the North American midden record have been willing to take the show on the road. So in 1994 I headed south and in the footsteps of Val Lamarche (now deceased), who pioneered the use of tree rings in South America. Val had long ago encouraged me to eventually do the same with middens. In my first foray, I obtained a Fulbright Fellowship to work in Argentina, and then spent the next 3 months in an old Ford pickup, collecting fossil rodent middens along the eastern foothills of the Andes (Markgraf et al. 1997; Betancourt and Saavedra 2002; Hofreiter et al. 2003). Ironically, among my Argentinian collaborators were the same guys that Lamarche had trained to do tree rings in the 1960s and 1970s. With funds from the InterAmerican Institute, in the late 1990s I expanded from Argentina into Bolivia, Chile and Peru, training Latin American colleagues and students along the way (Betancourt and Saavedera 2002; Holmgren et a. 2002). I struck scientific paydirt in the Atacama Desert of northern Chile.

The hyperarid Atacama Desert extends along the Pacific Andean slope from the southern border of Peru (18°S) to Copiapó, Chile (27° S). Seasonal and annual precipitation totals are determined by the number of precipitation days, and atmospheric circulation anomalies associated with those rainy days. Precipitation variability in both summer and winter is modulated primarily by tropical Pacific SST gradients and associated upper-air circulation anomalies. These anomalies promote either greater spillover of summer moisture from the Amazon and Altiplano to the east, or conversely, greater penetration of winter storms steered northward by migrating, cut-off-lows. In essence, the Atacama Desert represents the tail ends of the South American tropical and extratropical rainfall belts, both apparently modulated by the tropical Pacific.

Throughout the Quaternary, the most pervasive influence of climate variability on the Atacama Desert has been millennial-scale changes in the frequency and seasonality of the scant rainfall. During the past five years, my colleague Jay Quade (University of Arizona), our students and I have mapped modern vegetation gradients and developed a number of paleoenvironmental records, including vegetation histories from fossil rodent middens (Betancourt et al. 2000, Holmgren et al. 2001, Latorre et al. 2002, Latorre et al 2003), ground-water levels from wetland (spring) deposits (Rech et al. 2002; Rech et al. 200, and lake levels from shoreline evidence (Placzek et al. 2001), along a 1600-km transect (16-26°S) in southern Peru and northern Chile.

A strength of the Atacama transect has been the ability to apply the same methodologies across broad elevational, latitudinal, climatic, vegetation and hydrological gradients. This paleoclimate transect is being used to reconstruct the histories of the South American tropical and extratropical rainfall belts, precisely at those elevations where average annual rainfall wanes to zero. Our results for the central Atacama (~22-24ºS) indicate maximum summer precipitation between 11.8 and 10.5 cal kyr B.P., contrasting with pluvial lake highstands on the adjacent Altiplano from 26 and 15 cal kyr B.P. according to one group or 19-14 cal kyr B.P. according to another. At stake in the timing is the extent to which pluvial events are driven by summer insolation maxima over the Bolivian Altiplano (i.e., intensifying the Bolivian High) or by changes in tropical Pacific SST gradients. For those of you not following the most recent paleoclimatic literature, there is now compelling evidence that SST's in the so-called "warm" pool of the western Pacific has fluctuated by ~4ºC, in synchrony with global atmospheric CO_2 variations but leading Northern Hemisphere deglaciation by 2000-3000 years. If insolation variations drive the ice ages and other climatic variations, they would surely have to involve the tropical Pacific and its complex interaction with the extratropics.

Finally, the focus of the Atacama work has been on edge of absolute desert, an expansive

waterless terrain that extends from just above the coastal fog zone (1000 m) to more than 3000 m in the most arid sectors. We can pinpoint times and places in the past where vegetation invaded absolute desert. Our research has matured and can now be used to test theories and empirical models about the influence of present and past climate on both physical and biological processes, including historical development of latitudinal and altitudinal plant diversity gradients, constraints on rates and kinds of soil formation, and the influence of vegetation, and lack thereof, on microbial populations and processes. As a teaser, our field campaign in October-November 2002 involved, among other things, a transect of soil pits sampled every 300 m from 4500 m to sea level in the driest sector of the Atacama (24.5ºC). All of the soil pits, including those in absolute desert, registered microbial populations, with diversity patterns dictated by the nature and presence/absence of vegetation. These new studies will have broad implications for various disciplines, from astrobiology to soil science.

13. SCIENTIFIC LEADERSHIP

I have been part of the National Research Program since 1981, first as a graduate student working under the direction of a Project Chief, as a Project Chief since 1989, as Assistant Research Advisor for Ecology in 1992-1994 and as Research Advisor for the Ecology Discipline from 1994 to 1998. As Research Advisor, I was involved in most facets of management, from budgets to peer review. Also, I exploited what I think is one of my strongest managerial skills- effective advocacy of environmental science. I successfully advised management and 20 Project Chiefs in NRP-Ecology, with an annual budget of ca. $4-5 million. The list of research topics in NRP-Ecology includes, among others, microbial biogeochemistry of aquatic environments, plankton dynamics in tidal estuaries, bioavailability of trace elements in sediments, and organic-trace metal interactions in streams. In the act of promoting this rich menu, I often caught myself mustering as much appetite for my colleagues' science as for my own.

In the early 1990s, I gained visibility in the climate community due to some timely publications and my role in organizing the Pacific Climate (PACLIM) Workshops, which I inherited from Dave Peterson and bequeathed to Walt Dean (USGS-GD), Dan Cayan, Mike Dettinger (USGS-WRD) and others. In my tenure as chair, I raised $30K/yr from different federal and state agencies, as well as private entities such as Southern California Edison. With help from the California Department of Water Resources, I instituted a formal PACLIM Proceedings series as well as a policy of funding travel stipends for students interested in attending the workshops. In April 2003, the Annual PACLIM Workshop celebrated its 20th birthday

I have assumed leadership in large, multidisciplinary studies. I'm particularly proud of an international program funded through a 2-yr grant ($206,000, beginning June 1, 1996) from the Inter-American Institute (NSF and UCOR). The intent of the project was to develop a late Quaternary vegetation history of arid South America using fossil middens formed by a variety of rodents, drawing on the North American experience. In collaboration with scientists from Argentina, Chile, Peru and Bolivia, the project has trained South American graduate students and other professionals in techniques first developed in the western U.S. In order to reach the non-English speaking audience in Latin America, I wrote a synthesis of our work in Spanish and published it in *Revista Chilena de Historia Natural* (Betancourt and Saavedra 2002). This initial effort in South America laid the foundations for our eventual successes in the Atacama Desert.

My close colleague, Jay Quade, and I organized and convened an international workshop on the Paleoclimatology of the Central Andes (http://wwwpaztcn.wr.usgs.gov/pcaw/). The workshop, held in Tucson on January 11-16, 2001, was part of the PAGES (Past Global Changes), PEPI (Pole-Equator-Pole) initiative for coordinating paleoclimatic and paleoenvironmental research along a transect through the Americas. The necessary funds for the workshop were obtained from two programs at the National Science Foundation, Earth System History and the Inter-American Institute. On board were 60 scientists from Canada, Chile, England, France, Germany, Peru, Switzerland and the United States.

Because the tropics have obviously played a more important role in past global changes than previously thought, the Central Andes (10-30°S) have fast become one of the most active stages for paleoclimatological research. This research has involved ice core measurements from tropical ice sheets, geomorphological evidence for glacial advances and retreats, limnological evidence from large (50,000 km2) and small (<1 km^2) lakes, fossil rodent middens and various other kinds of climate proxies. The recent flurry in research, however, has yet to produce consensus about the magnitude and timing of temperature and precipitation fluctuations, much less the forcing and large-scale mechanisms involved in climate change. With the acceleration of paleoclimatological research in the last decade have come heated controversies about the history of the South American Summer Monsoon. These controversies have become evident in special sessions on South America paleoclimatology at recent annual meetings of the Geological Society of America and American Geophysical Union. Hence, we convened an international workshop on Central Andes paleoclimatology to get updates on new research and to take stock of agreements and disagreements among the various proxies. Papers from the Central Andes Workshop, including a couple of our own (Latorre et al. 2003, Rech et al 2003) recently appeared in a dedicated volume of *Palaeogeography, Palaeoclimatology, and Palaeoecology*.

I have always made a point of highlighting the implications of my research for water and resource management. For example, the expansion of Utah juniper woodlands into rangelands in Wyoming and adjacent states during the past century is well-documented but poorly understood. Woodland expansion presents a management challenge for ranchers and public-land managers committed to maintaining sage-grasslands and mosaic patterns of vegetation on the Wyoming landscape. During the past few years, my colleague Steve Jackson (Univ. of Wyoming) and I have collaborated on a study tracking the Holocene migration of both Utah juniper and ponderosa pine in the central Rockies. In June 2000, we organized a workshop at the Nature Conservancy's Tensleep Reserve in the Bighorn Mountains of northern Wyoming to bring together academic researchers, resource managers, and ranchers to share information and discuss management issues, particularly as affected by our research results (http://wwwpaztcn.wr.usgs.gov/wyoming/workshop2000.html). Our contributions to these issues also have been featured by environmental journalists (see Kloor, Keith, 2000: "Returning America's Forests to Their 'Natural' Roots," *Science*, 287, 573-75; http://www.sciencemag.org/cgi/content/full/287/5453/573).

In 2004-2005, my service has included organization of the AIBS-NEON August 2004 workshop on ecological responses to climate and publication of a comprehensive white paper in October 2004 (http://www.neoninc.org/documents/neon-climate-report.pdf), co-leadership in an exciting initiative to help jumpstart a USA-National Phenology Network, which included a successful workshop in August 2005 funded by NSF and four other federal agencies (http://www.uwm.edu/Dept/Geography/npn/), and participation on a current (2005-2006) NRC Committee that is reviewing the scientific basis for managing Colorado River water resources. Closer to home, I have organized an outreach and demonstration project in the Tucson and Pima County to stem buffelgrass invasion and the unhinging of a unique American ecosystem- the Sonoran Desert (http://wwwpaztcn.wr.usgs.gov/buffelgrass/).

Finally, I have played a long-term role at the Desert Laboratory on Tumamoc Hill, an ecological reserve situated amid 352 ha of largely undisturbed Sonoran Desert, on Tucson's westside (http://wwwpaztcn.wr.usgs.gov). Founded in 1903 by the Carnegie Institution of Washington for studying the adaptations of plants to arid, the Desert Lab has since broadened its perspective to include not only plant ecologists and physiologists but also hydrologists, paleontologists, palynologists, and geochemists, many of whom take a long-term approach in their research. The Desert Lab is a unique institution in that it involves co-housing and direct collaboration between the University of Arizona's Department of Geosciences and the USGS, WRD. USGS presence at the Desert Laboratory dates back to 1976, when Ray Turner established an office on Tumamoc Hill. Since then, USGS has been responsible for maintaining the permanent plots and perpetuating long-term ecological research on the Hill.

Over the past decade, I have pitched in to represent the Desert Lab across the University and general scientific community, as well as the general public. Since 1990, the long-term monitoring was

done with resources from either my or Bob Webb's NRP projects. Although my colleague Jay Quade, as professor of geosciences at the University of Arizona, is the official Director of the Desert Laboratory (I am presently Acting Director), I carry an equal share of the administrative responsibility. For example, one of the greatest threats to the Desert Lab has been the potential loss of 40% of Tumamoc Hill to development. About 140 ha of Tumamoc Hill are State of Arizona Common School Trust Lands, which are supposed to generate revenue for public schools (K-12). The Desert Lab has been paying a nominal lease for the land, which contains some of our longest-monitored plots, but in 1997 there was the threat of sale and development of the land in question. Since then, I've been heavily involved in getting the University to purchase the land with county and state funds reserved for conservation and open space. The latest challenge involved an abandoned landfill on the edge of the property (http://wildcat.arizona.edu/papers/96/20/01_1.html). The public auction for the 140 ha was canceled in April 2003, prompting me to write a lengthy *op ed* piece for the Tucson Citizen. I am presently working with Governor Napolitano's office to find an alternate solution.

14. SCIENTIFIC AND PUBLIC SERVICE

- **CURRENT MEMBERSHIPS IN PROFESSIONAL SOCIETIES**:

International Biogeography Society (founding member)
American Geophysical Union

- **TECHNICAL PRESENTATIONS** (only talks listed are those that I presented; 77 presentations at technical meetings, **NOT UPDATED past 2003**)

"PDO, AMO, and megadrought in the Western U.S.," Annual Symposium of the Arizona Hydrological Society, Mesa, Arizona, Sept. 19, 2003.

"The current drought in historical perspective," New Mexico Drought Summit, organized by the State Engineer's Office and Southwest Strategy, Sept. 16, 2003 (INVITED PLENARY).

"The current drought in historical perspective," Citizen's Water Advisory Council, Tucson Water, Sept. 9, 2003

"The current drought in historical perspective," Southwest Drought Summit, Northern Arizona University, Flagstaff, May 12-13 (INVITED PLENARY).

"The current drought in historical context" Workshop on Land Management in a Changing Climate, May 25, 2003, Sustainable Technologies, Agribusiness and Resources (STAR) Research Center and Department of Applied Biological Sciences, Arizona State University East Campus, Mesa, AZ, (INVITED PLENARY).

"Ecosystem responses to climate variability," USGS Workshop on Development of Integrated Models to Forecast Landscape Change, Tucson, AZ, April 14, 2003.

"Vegetation and Climate History of the Atacama Desert and Pacific slope of the Central Andes," 20th Annual Pacific Climate Workshop, Pacific Grove, CA, April 8, 2003 (INVITED TALK).

"Prospects for ongoing drought in Arizona and the Southwest," Briefing to the Governor's Task Force on Drought, Arizona Department of Water Resources, Phoenix, AZ, March 15, 2003.

"New frontiers for interdisciplinary, field research programs: An example from the Atacama Desert" Inaugural meeting of the International Biogeography Society, Mesquite, Nevada, Jan. 2003 (INVITED PLENARY)

"Historical context for ongoing drought in the Southwest, Rockies and Great Plains" Colloquium, Arizona Department of Water Resources, Nov. 2002, Tucson (INVITED)

"Multidecadal oscillations in the drought-sensitive tree-ring record of the central and southern Rockies" Drought in Mesic and Arid Environments: Climatology, Biotic Responses, and Feedback. Workshop Funded by the National Science Foundation (IGERT and Biocomplexity Programs) and the University of New Mexico Center for Advanced Studies, Sept. 2002, Sevilleta LTER Research Station, New Mexico (INVITED).

"A History of the Desert Laboratory: 1903-2002" Ecological Society of America Annual Meeting, Tucson, Aug. 2002 (ESA Meeting Field Trip organized by Jan Bowers and myself)

"Paleoclimatology of the Central Andes and Atacama Desert" Western Region Colloquium, USGS, Menlo Park, Dec. 2001 (INVITED)

"Late Quaternary climate change in the central and southern Andes from an Atacama perspective," XIII Reunion Nacional de Botanica, Universidad de La Serena, La Serena, Chile Sept. 2001 (INVITED KEYNOTE)

"Role of environmental heterogeneity and climate variability in plant invasions: insights from the fossil record," California Plant Pest Council Annual Meeting, San Diego, Sept. 2001 (INVITED KEYNOTE)

"Late Quaternary biogeography and climate of the Pacific slope of the central Andes. "Workshop on Climate Change at High Elevation Sites: Emerging Impacts, Davos, Switzerland, June 2001 (INVITED)

"Historic climate variability and vegetation dynamics in the southwestern U.S.: Empirical needs for predicting future vegetation change." USGS Workshop on Present and Future Climate in the Southwestern U.S., Tucson, AZ April 2001 (INVITED).

"Long-term history and dynamics of North American pinyon-juniper woodlands," Workshop on the Biocomplexity of Pinyon-Juniper Woodlands, Flagstaff, AZ, Jan. 2001 (INVITED).

"Vegetation and winter rainfall history of the southern Atacama Desert" Central Andes Paleoclimate Workshop, Tucson, Jan. 2001 (I organized the workshop and gave one of the talks)

"Evidence and management implications of ecosystems presently undergoing natural migration," American Geophysical Union, San Francisco, Dec. 2000 (INVITED)

"Late Quaternary history of North American junipers." Society of Range Management Annual Meeting, February 2000, Boise (INVITED)

"Paleoflood hydrology in the western U.S." USGS, WRD, Western Region District Chiefs Meeting, February 2000, La Jolla (INVITED)

"Climate variability and surface water: Southwest" Western Region District Chiefs Meeting, February 2000, La Jolla (INVITED)

"Regional Synchrony of Vegetation Disturbance and Demography in the Southwestern U.S.," October 1999, Southwestern Association of Biologists, Ghost Ranch, NM (INVITED KEYNOTE)

"Fossil rodent middens and vegetation history of the central Atacama Desert, northern Chile," August 1999, Ecological Society of America 84th Annual Meeting, Spokane (PRESENTED)

"Climatic variability in the American Southwest: Is it a factor in conservation?", 26th Annual Natural Areas Association Conference, Oct. 13-16, 1999, Tucson (INVITED)

"Fire effects on western watersheds," National Research Council panel on USGS activities, November 1999, Menlo Park, CA (INVITED)

"Historical Ecology and Ecosystem Management: Using the Past to Manage the Future"; Association of Forest Service Employees for Environmental Ethics, April 28, 1998, Oracle, AZ (INVITED)

"The Middle Holocene in the Americas"; PEP-1 Pole-Equator-Pole Paleoclimate in the Americas; Session Coordinator and Presentor; March 19, 1998; Merida, Venezuela (INVITED)

"The 1950s Workshop: Drought in the American Southwest"; Workshop Coordinator and Presentor; January 7-9, 1998; Sevilleta LTER Research Station, New Mexico (INVITED)

"A Natural History of the American Southwest"; Julio Betancourt, Western Region Colloquium, USGS, November 24, 1997, Menlo Park, CA (INVITED)

"USGS Fire-Watershed Activities"; U.S. Forest Service Future of Fire Research Workshop, October 10, 1997; Park City, Utah (INVITED)

"Synchronized, regional establishment and mortality across southwestern woodlands"; USDA Forest Service, Workshop on Pinyon-Juniper Woodlands, Julio Betancourt, Brigham Young University, September 15, 1997, Provo, Utah (INVITED)

"Effects of Climate Variability on Southwestern Ecosystems," Regional Workshop on Climate Impacts (CLIMAS) in the Southwestern U.S., Udall Policy Center, University of Arizona, September 3, 1997, Tucson (INVITED)

"USGS Fire-Watershed Activities" Interagency Fire Center; August 26, 1997; Boise, Idaho (INVITED)

"New Perspectives on the Environmental History of the Desert Southwest"; Society of Environmental Journalists, October 3, 1997, Tucson, AZ, (INVITED)

"Vegetation history of the Sevilleta LTER", NSF Site Review, Sevilleta, LTER, Sept. 22, 1997, Albuquerque, NM (INVITED)

"Effects of Climate Variability on Southwestern Ecosystems" Regional Workshop on Climate Impacts in the Southwestern U.S., Udall Policy Center, University of Arizona, September 3, 1997, Tucson (INVITED)

"USGS Fire-Watershed Activities" Arizona WRD District; June 17, 1997, Tucson, Arizona

"Climate variability and ecosystem change in the North American Deserts" USDA, Forest Service, Verde Valley/Prescott Microfloral Ecosystem Workshop, Sedona, AZ, Keynote Address, June 1997 (INVITED)

"Climate variability and ecosystem change in the North American Deserts," Western Naturalists Association, Jan. 1997, La Paz, Baja California. (INVITED)

"Lessons from vegetation history in the southwestern U.S." Lake Tahoe, UN-Reno and DRI, Changing Water Regimes in Drylands Conference, Desert Research Institute and University of Nevada, Reno, June 1997 (INVITED)

"A Natural History of the American West" Keynote Public Lecture for Public Conference on "Field Scientists and the Shaping of the American West," Center of the American West, UNIV of Colorado, March 1996 (INVITED)

"Climate variability and catastrophic drought in the southwestern U.S.," New Mexico Chapters of the Society for Soil and Water Conservation and Society for Range Management, Socorro, NM, Keynote Speaker, Dec. 1996 (INVITED)

"Climate variability as a constraint on management and restoration of riparian areas," Arizona Riparian Council 10th Annual Meeting, Prescott, Arizona, Keynote Speaker, April 12-13, 1996 (INVITED)

"Long and short-term climatic influences on southwestern shrublands," 9th Wildland Shrub Symposium (Theme: Shrub Ecosystem Dynamics in a Changing Environment), USDA-Forest Service, Las Cruces, Keynote Speaker, May 1995 (INVITED)

"Extreme climate variability: Planning for natural catastrophe", Tucson, Arizona Hydrologic Society's 8th Annual Symposium, Keynote Speaker, Sept.14-16, 1995 (INVITED)

"Plant physiological responses to CO_2 variations during last glacial-interglacial cycle,"Carbon Cycle Workshop, USGS, Boulder, Feb. 1994.

"Climate variability in the North American subtropics," NSF and PAGES (Past Global Changes), A Core Project of the International Geosphere-Biosphere Programme (IGBP). Pole-Equator-Pole Research (PEP) Initiative, "Late Quaternary Paleoclimates in the Americas: Dynamics of Past Climate Change and its Forcing Along a Transect from Pole to Pole," Smithsonian Tropical Research Institute, Panama City, Panama, October 1993. (INVITED)

"Ecological Consequences of the 1950s drought in the American Southwest," Ecological Society of America, Madison, Wisconsin August,1993. (INVITED)

"Influence of climate variability on southwestern vegetation," Hot Deserts Symposium, Society of Range Management, Phoenix July 1993. (INVITED)

"Influence of climate and history on New Mexico pinyon-juniper woodlands," Symposium on Managing Pinyon-Juniper Woodlands for Sustainability and
Social Needs, U.S. Forest Service & New Mexico Land Department, Santa Fe April, 1993. (INVITED)

"Ecological consequences of the 1950s drought in the American Southwest," Global Change Lecture Series, U.S. Geological Survey, Reston, VA, January 1993.

"Plant physiological responses to CO_2 variations during last glacial-interglacial cycle," Project Chief's meeting, U.S. Geolological Survey, WRD, Menlo

"Resetting demographic clocks: Tree mortality during the 1950s drought in the southwestern U.S." Workshop: Managing Arid and Semiarid Lands in the Face of Global Change, National Center for Atmospheric Research and U.S. Forest Service, Boulder, October 1992 (INVITED)

"Historical imprints on Rocky Mountain forests and woodlands," Annual Meeting of the Western Forest Genetics Association, Boulder, July 1992 (Keynote). (INVITED)

"El Niño, biomass burning and interannual variations in the global carbon budget," INSTAAR, Boulder, April 1992.

"El Niño, biomass burning and interannual variations in the global carbon budget," Western Region, Menlo Park, April 1992.

Discussant, Tanner Lectures on Human Values, Speaker: Jared Diamond, University of Utah, April, 1992.

"El Niño, biomass burning and interannual variations in the global carbon budget," Global Change Lecture Series, National Headquarters, Reston, January 1992.

"Climatologies and carbon gas emissions associated with large historic wildfires," 10th International Symposium on Environmental Biogeochemistry, San Francisco, August 1991 (INVITED)

"Long-term history of the woodland-desert grassland ecotone in the southwestern U.S." Scientific Committee on Problems of the Environment (SCOPE) Workshop, Kellogg Long-Term Ecological Research Station, Michigan, March 1991 (INVITED)

"The role of climate and land use in channel changes and flood frequency of the Santa Cruz River, southern Arizona", USGS-WRD Research Committee Meeting, Rio Rico, Arizona, February 1991.

"Historical phenomena and their imprint on southwestern biodiversity," Southwestern Biodiversity Symposium, Las Cruces, July 23-25, 1990. (INVITED)

"New developments in southwestern paleoecology and paleoclimatology", National Headquarters, Reston, December 1990.

"El Niño, La Niña and Fires in the American Southwest," U.S.G.S., Joint Disciplinary Meetings, Ecology and Water Chemistry, Estes Park, May 1990.

"Fire-Southern Oscillation relations in the southwestern United States," U.S.G.S., Reston, December 1989.

"Climatic variability and flood frequency in southern Arizona," Sixth Annual Pacific Climate (PACLIM)

Workshop, Asilomar, California, March 5-8, 1989. (PRESENTED)

"Vegetation history in the monsoonal Southwest," Workshop: Climatic Change in Arid Lands, NASA and University of Washington, Seattle, July 1988. (INVITED)

"El Niño, La Niña, and Southwestern weather," Arizona District, Seminar Series, Tucson, September 1988.

"An overview of Southwestern American climate and ENSO processes," Paleoecology Workshop sponsored by NSF and NOAA, Boston, Massachusetts, February 15-17, 1988. (INVITED)

"Packrat midden research in the western U.S.," and "Climate, land use, and channel history for the Santa Cruz River, Tucson," Global Change Lecture Series, National Headquarters, Reston, April 1987.

"Vegetation of the southwestern U.S.: The late glacial transition," XII International Quaternary Congress, Ottawa, Canada, August 1987. (INVITED)

"Southern Arizona flooding during El Niño years: Floodplain management implications," and "Late Quaternary vegetation history of the southwestern U.S.: The packrat midden record," Fourth Annual Pacific Climate (PACLIM) Workshop, Asilomar, California, March 1987. (INVITED)

"Sampling patterns in the packrat midden record", 99th Annual Meeting of the Geological Society of America, San Antonio, Texas, November 1986. (PRESENTED)

"Paleoecology of pinyon-juniper woodlands in the western U.S.: Summary," (Session chairman and speaker), 2nd Pinyon-Juniper Conference, USDA Forest Service and University of Nevada, Reno, January 1986. (INVITED)

"El Niño, biomass burning and interannual variations in the global carbon budget," Western Region, Menlo Park, April 1992.

"El Niño, biomass burning and interannual variations in the global carbon budget," Global Change Lecture Series, National Headquarters, Reston, January 1992.

"The role of climate and land use in channel changes and flood frequency of the Santa Cruz River, southern Arizona", USGS-WRD Research Committee Meeting, Rio Rico, Arizona, February 1991.

"New developments in southwestern paleoecology and paleoclimatology", National Headquarters, Reston, December 1990.

"El Niño, La Niña and Fires in the American Southwest," U.S.G.S., Joint Disciplinary Meetings, Ecology and Water Chemistry, Estes Park, May 1990.

"Fire-Southern Oscillation relations in the southwestern United States," U.S.G.S., Reston, December 1989.

"El Niño, La Niña, and Southwestern weather," Arizona District, Seminar Series, Tucson, September 1988.

"Packrat midden research in the western U.S.," and "Climate, land use, and channel history for the Santa Cruz River, Tucson," Global Change Lecture Series, National Headquarters, Reston, April 1987.

"Historic arroyo-cutting and subsequent channel changes at the Congress Street crossing, Santa Cruz River, Tucson, Arizona," International Arid Lands Research and Development Conference, Tucson, Arizona, October 1985. (INVITED)

"Geomorphic implications of late Quaternary vegetation changes in the Colorado River Basin" Geological Society of America Penrose Conference, Lake Havasu, Arizona, April 1985. (INVITED)

"Role of summer rainfall in the late Quaternary distribution of *Pinus edulis* in the southwestern U.S.," American Quaternary Association Sixth Biennial Meeting, Boulder, Colorado, August 1984. (INVITED)

"Holocene vegetation history of Chaco Canyon, New Mexico," Society for American Archeology, San Diego, California, May 1981. (INVITED)

- **RENDERING SCIENTIFIC JUDGMENT (not updated past 2003)**

Editorial Board, *Diversity and Distributions*, current.

In 1998, I helped conceive and coordinate an NSF (Earth System History and InterAmerican Institute) initiative that discounts Accelerator Mass Spectrometer ^{14}C dates for Latin American Quaternary scientists. I was part of a committee of four U.S. scientists that reviews as many as 25 proposals a year.

Search Committee, Assistant Professor Search, Laboratory of Tree-Ring Research, University of Arizona, 1999-2000

Science Advisory Committee, Arizona District, WRD, USGS, 1998-1999

Advisory Committee, Institute for the Study of Planet Earth, University of Arizona, 2000-present

Advisory Committee, University of Arizona Press, 1997-1999

Search Committee, Geomorphologist Search, Dept. Geosciences, University of Arizona, 1998-1999

NSF Geology and Paleontology, Earth System History, Hydrology, Geography and Ecology Programs, Proposal Reviews

National Geographic Society, proposal reviews

NSF, PAGES, Pole-Equator-Pole Paleoclimate Program, Steering Committee Member, 1996-1997

USGS, Mapping Division: Consultation on starting Research Program like NRP in Mapping Division (Nov. 1998).

NSF Earth System History (ESH) Panel Member, 1995, 1996, 1997

USGS Global Change Program, Science Advisory Panel, 1995, 1996

University of Arizona Global Change Committee, 1995-present

USGS NAWQA Trends Committee, 1994

USGS BioTask Group, 1993-1994

Search Committee, Systems Ecology Position, University of Arizona, 1994

USGS, Technical Advisory Group, Nuclear Hydrology Program, Nevada Nuclear Waste Storage Investigations. 1993

- **LECTURESHIPS AND OTHER ACADEMIC SERVICE (not updated past 2003)**

Invited Departmental Seminars (60 seminars):

"Advances in Arid Lands Paleoecology: The rodent midden record in the Americas," Department of Geography, University of Nevada, Reno, October 9, 2003.

"Historic and modern megadroughts, their causes and impacts, " University of Nevada, Reno, Ecology Evolution & Conservation Biology Program October 8, 2003.

"PDO, AMO, and megadrought in the Western U.S.," Society for Earth Sciences Students, University of Arizona, Sept. 26, 2003.

"PDO, AMO, and megadrought in the Western U.S.," Departmental Seminar, Laboratory of Tree-Ring Research, University of Arizona, Sept. 24, 2003

“Recent Advances and Prospectus for Arid Lands Paleoecology” Departmental Colloquium, Department of Geography, University of Arizona, Jan. 2003.

“Climatological and environmental circumstances for megadroughts across the western U.S.” Department of Soil, Water and Environmental Sciences, University of Arizona, Nov. 2002.

“The fossil rodent midden record in the Americas: Synthesis and update” Departmental Colloquium, Department of Population, Organismic, and Physiological Biology, University of Colorado, Sept. 2002.

“Paleoclimatology of the Central Andes and Atacama Desert” Departmental Colloquium Speaker, Department of Geosciences, University of Arizona, Jan. 2002.

“Vegetation dynamics at decadal to millennial time scales in western North America: Lessons for Ecology and Ecosystem Management,” Paleoclimatology of the Atacama Desert and central Andes, Department of Geography, UCLA, Nov. 2001.

“Paleoclimatology of the Central Andes and Atacama Desert,” UCLA, Nov. 2001.

“Vegetation dynamics at decadal to millennial time scales in western North America: Lessons for Ecology and Ecosystem Management,” Department of Biology, Utah State University, Oct. 2001.

"Vegetation dynamics at decadal to millennial time scales in western North America: Lessons for Ecology and Ecosystem Management," College of Natural Resources, University of California-Berkeley, Feb. 2001

"Vegetation dynamics at decadal to millennial time scales in western North America: Lessons for ecology and Ecosystem Management," Department of Geology, Department of Biology, University of Utah, Jan. 2001

"Climate and vegetation history of the western U.S." Colorado College, Sept. 1999

"Reconstructing past environments using fossil rodent middens in the Americas," Universidad de San Agustin de Arequipa, Arequipa, Peru, June 1999

"Reconstructing past environments using fossil rodent middens in the Americas," Universidad de San Marcos, Lima Peru, May 1999

"Mesoscale responses of ecosystem to decadal-scale climate variabiliy," University of Colorado, Nov. 1998,

"The 1950's Drought in the American Southwest," University of Arizona, university-wide Global Change Lecture, March 1998.

"Ecophysiological responses to CO_2 enrichment during the last deglaciation," Dept. of Biology, Arizona State University, Tempe, AZ, February 1997

"Reconstructing past environments using fossil rodent middens in the Americas, .Universidad de Chile, Santiago, Universidad Catolica de Chile, Santiago, March 1997

"Microevolutionary response to environmental changes during the last deglaciation," New Mexico State University, Socorro, Dec. 1996

"Ecosystem and watershed response to 20th century climate variability in the southwestern U.S.", Columbia University, Biosphere 2, Tucson, October '96, February '97.

"Microevolutionary response to environmental changes during the last deglaciation", Ohio State University, Columbus, Feb. 1996, Kent State University, Feb. 1996

"Microevolutionary response to environmental changes during the last deglaciation," Arizona State University, Phoenix, Sept. 1996.

"Microevolutionary response to environmental changes during the last deglaciation,"
Univ. of Nevada-Las Vegas, April 1996.

"A new method of reconstructing late Quaternary vegetation of the South American deserts," University of Chile, Santiago; Universidad Mayor de San Andres-La Paz, Bolivia, Instituto Miguel Lillo, Tucuman, Argentina, July 1996

Short Course, "El Clima y su relacion con el cambio global: Aplicaciones en la gestion y conservacion de

los diferentes ecosistemas," Universidad de Andalucia, Centro Andaluz de Estudios Iberoamericanos, La Rabida, Spain, August 1995.

Three lectures in Univ. of Arizona departmental seminars (Office of Arid Land Studies, Laboratory of Tree-Ring Research, and Soil and Water Sciences), Fall 1995

"Physiological response of limber pine to CO_2 enrichment during deglaciation," Dept. of Ecology, Evolution & Behavior, University of Minnesota, Minneapolis, May 1994.

"Ecological consequences of the 1950s drought in the North American subtropics,"
Dept. of Ecology, Evolution & Behavior, University of Minnesota, Minneapolis, May 1994.

"20th century climate variability in the North American subtropics: Ecological and hydrological consequences," Quaternary Research Center, University of Washington, Seattle, February 1994.

"Physiological response of limber pine to CO_2 enrichment during deglaciation," College of Forestry, Univ. of Washington, Seattle, February 1994.

"Resetting demographic clocks: Influence of catastrophic drought in southwestern woodlands," Dept. of Biology, Northern Arizona University, Nov. 1993.

"El Niño, biomass burning and interannual variations in the global carbon budget," Dept. of Biology, Northern Arizona University, Nov. 1993.

"Changes in plant stomatal density and carbon isotope ratios during the last deglaciation," Dept. of Geology, Northern Arizona University, Nov. 1993.

"Ecological consequences of the 1950s drought: A natural, cross-scale experiment," Laboratory of Tree-Ring Research, University of Arizona, February 1993.

"El Niño, biomass burning and interannual variations in the global carbon budget," Sigma Xi Annual Lecture, Auburn University, October 1992

"Packrat historians and the last 40,000 years of biotic change in the American West," Weaver Lecture Series, Auburn University, October 1992.

"El Niño, biomass burning and interannual variations in the global carbon budget," Geography Departmental Seminar, University of Georgia, October 1992.

"Packrat historians and the last 40,000 years of biotic change in the American West," Institute of Ecology, University of Georgia, October 1992.

"El Niño, biomass burning and interannual variations in the global carbon budget," Scripps Instution of Oceanography, La Joya, CA, June 1992

"El Niño, biomass burning and interannual variations in the global carbon budget," Ecology & Evolutionary Biology Departmental Seminar, University of Arizona, April 1992.

"El Niño, biomass burning and interannual variations in the global carbon budget," INSTAAR,

University of Colorado, Boulder, April 1992.

Discussant, Tanner Lectures on Human Values, Speaker: Jared Diamond, University of Utah, April, 1992

"El Niño, biomass burning and interannual variations in the global carbon budget," Biology Dept. Seminar, University of Utah, Salt Lake City, April 1992.

"Packrat historians and the last 40,000 years of biotic change in the American West," Geography and Geology Dept. Seminar, University of Utah, Salt Lake City, April 1992.

"El Niño, biomass burning and interannual variations in the global carbon budget," Agricultural Research Service, USDA, Tucson, April, 1992

"El Niño, biomass burning and interannual variations in the global carbon budget," "Packrat historians and the last 40,000 years of biotic change in the American West, and "Laminated ice deposits as climatic proxies from (invited talks), Idaho National Engineering Laboratories, Idaho Falls

"El Niño, biomass burning and interannual variations in the global carbon budget," Geography Dept. Seminar, Arizona State University, Jan. 1992

"Packrat Middens: The last 40,000 years of biotic change," Ohio State University, Columbus, Ohio, March 1991.

"The past as the key to the present: Relevance of paleoecology to management of pinyon-juniper and grassland habitats," New Mexico State University, Las Cruces, January 1990.

"Southwestern U.S. watershed responses to the Southern Oscillation," University of Nevada-Reno, November 1990.

"Stable isotopes, stomatal density, and DNA in fossil leaves: New application for packrat middens," University of Nevada-Reno, November 1990.

"Packrat middens, fire scars, and varved ice: New developments in southwestern paleoecology/paleoclimatology," University of New Mexico, Albuquerque, October 1990.

"Fire and flood: El Niño effects in the Southwest," Department of Biology, University of New Mexico, Albuquerque, April 1989.

"Vegetation history of the Southwest," Department of Biology, University of New Mexico, Albuquerque, April 1989.

"Hydroclimatology and geomorphic history of the Santa Cruz River, southern Arizona," Desert Laboratory Seminar Series, University of Arizona, Tucson, November 1988.

"Long-term climatic variability and ecological change in the North American deserts," University of Colorado, Boulder, September 1988.

"Biogeografia de los desiertos norteamericanos, explicaciones historicas," Centro de Investigaciones Biologicas, La Paz, Baja California, October 1987.

"Plant macrofossil data from the western U.S., methods and applications," New Mexico Mining and Technological Institute, Socorro, July 1987.

"Climate and vegetation dynamics in the southwestern deserts and uplands," Oregon State University, Corvallis, Oregon, July 1987.

"Chronology and dynamics of vegetation change in the southwestern U.S. during the late glacial transition," University of Texas, El Paso, Texas, February 1987

Courses Taught:

Short Course, Global Change in the Americas, Universidad de Andalucia, Spain, Sept. 1996

Environmental history of the Southwest (GEOS 220), Univ. of Arizona, Fall-Spring 1999-2000, this is a General Education/Natural Science (Tier 2: Sophomore level) class that I developed with my long-term colleagues Tom Swetnam and Jeff Dean. The class now has an enrollment of ~125 students.

Graduate Students and Postdoctoral fellows Advised:

Postdocs

Steve Gray, NRC Postdoctoral Fellow 2004-2006 (USGS)

Sean Connin, Ike Russell Postdoctoral Fellowship 1996-1997 (Desert Laboratory, Univ. Arizona)

Quinfeng Guo, Ike Russell Postdoctoral Fellowship 2000-2002 (Desert Laboratory, Univ. Arizona)

Graduate Students

Amanda Reynolds, Ph.D. current, "Hydrological, ecological and archeological use of radiogenic isotopes as tracers in the San Juan Basin, New Mexico"

Camille Holmgren, M.S., 2000, "Holocene vegetation history of the Arequipa region, southern Peru," Ph.D., current, (Univ. of Arizona), "Vegetation history of the U.S./Mexico Borderlands.", Ph.D., 2005, "Late Quaternary history of the northwestern edge of the Chihuahuan Desert."

Tamara Wilson, M.S., 2002, "Precipitation regionalization and synoptic climatology of Baja California," Ph.D., current (Univ. of Arizona), "Late Quaternary history of vegetation and climate of northern Baja California."

Jodi Norris, Ph.D., current (Univ. of Wyoming), "Bioclimatology and migrational history of ponderosa pine in the central Rockies"

Steve Gray, Ph.D., current (Univ. of Wyoming), "Tree-ring assessment of climate and streamflow variability in the central Rockies"

Claudio Latorre, Ph.D., 2002 (Univ. of Chile), "Vegetation and climate history of the Calama/Atacama Basins, northern Chile."

Jason Rech, Ph.D. 2001 (Univ. Arizona), "Paleohydrology of the central Atacama Desert, northern Chile"

Mark Lyford, Ph.D., 2001 (Univ. of Wyoming), "Migrational history of Utah juniper (*Juniperus osteosperma*) east of the Continental Divide"

Angela Barclay, M.S., 2000, (Univ. Arizona), "Effects of ryegrass reseeding on native plant species in burned ponderosa pine forests"

Crista Plazcek, M.S., 2000, (Univ. of Arizona), "Holocene lake history of Laguna Aricota, southern Peru."

Peter Van de Water, Ph.D. 1999 (Univ. Arizona), "$\delta^{13}C$ and stomatal density variability in modern and fossil leaves of key plants in the western United States"; M.S. 1993 (Univ. Arizona), "Ecophysiological response of *Pinus flexilis* to atmospheric CO_2 enrichment during deglaciation"

Elise Pendall, Ph.D. 1997 (Univ. Arizona), "Precipitation seasonality recorded in D/H ratios of pinyon pine cellulose in the southwestern United States"

Lisa Pedicino, M.S. 1997 (Univ. Arizona), "Carbon isotopic variations in 7 southwestern U.S. plants from herbarium collections of the last 150 years"

Kim Hunter, Ph.D. 1996, (Univ. Nevada-Las Vegas), "A molecular phylogenetic analysis of the *Larrea* complex"

Paul V. Dickfoss, M..S., (Ohio State University), "Stratified ice accumulations as a source of climate proxy data."

Many of my former students have gone on to bigger and better things. Kim Hunter is now an Assistant Professor in Biological Sciences at Salisbury State University. Elise Pendall just landed a tenure-track position in the Department of Botany, University of Wyoming. Jason Rech did the same in the Department of Geology, Miami University of Ohio. Claudio Latorre is a tenure-track Assistant Professor at Universidad Catolica de Chile (Santiago). Antonio Maldonado has a position at the Universidad de La Serena, Chile. Pete Van de Water is now a Mendelhall Postdoc with USGS. Steve Gray completed a postdoc at Montana State University, and is now an NRC postdoctoral fellow in my lab.

Undergraduate Students

I usually employ and mentor 2-3 undergraduate students a year from the University of Arizona's Departments of Geosciences, Ecology & Evolutionary Biology, Plant Sciences, and Renewable Resources (since 1995: Angela Rickaway, Mike Wall, Leslie Parkinson, Mika Jenzen, Shawn Byron, Beth Barton, Beth Duschatko, Bobby Gillis, Elena Henry, Tim Fischer, Erin Gleeson, Ben Wilder, Katy Giroux). I have also taken on undergraduate apprentices during the summer from other universities (Richard Barclay, Western Washington University). Because I came up though the USGS Minority Participation in the Earth Sciences Program, I have taken special interest in mentoring MPES students through at least two of their undergraduate years (Carlos Mendoza, Gabriel Cisneros). A few of these students (Leslie

Parkinson, Mike Wall, Bobby Gllis, Tim Fisher, Erin Gleeson, Ben Wilder) have been honored as the outstanding senior of their graduating class in their respective departments.

Several of these students have gone on to do quite well. For example, Carlos Mendoza is now a senior engineer with the city of Vista, California. My personal physician's husband, who is a microbiologist, hired Leslie Parkinson as a technician in his pharmaceutical company here in Tucson. Both Leslie and Mike Wall were voted outstanding seniors of their class at the University of Arizona. Angela Rickaway (now Angela Barclay) went on to do her M.S. at the University of Arizona working with me on the effect of reseeding after wildfires. Angela now works for an environmental firm in southern Arizona.

Richard Barclay (no relation to Angela) is now a Ph.D. student in paleoecology at the Univ. of Florida, Gainesville. For his Ph.D., Rich is analyzing in great detail the flora within a highly fossiliferous K-T boundary locality in the eastern portion of the Denver Basin, Colorado. For his M.S at Univ. of Washington, Gabe Cisneros mapped the geology of the eastern Panamint Mountains, Death Valley. He later pitched in to help with my October-November 2002 field campaign in the Atacama Desert. Gabe is currently employed as a geologist with an environmental consulting firm in Seattle. Bobby Gillis completed his M.S. thesis on Tertiary shortening and exhumation of the Eastern Cordillera in northern Bolivia, and is now working for the Alaska Geological Survey. Tim Fischer is working on his Ph.D. in Geosciences at Penn State. Erin Gleeson is headed for a graduate program in paleoclimatology in Switzerland, and Ben Wilder has applied to several prominent graduate programs in ecology.

- **TECHNICAL TRAINING PROVIDED:**

USDA, Forest Service Training Center, Ecosystem Management-Regions 2 and 3, Climate Variability and Ecosystem Management (3 hrs), Phoenix.

f. SPECIAL ASSIGNMENTS: I served on the National Academy of Sciences-National Research Council Water Sciences Board Committee on *Scientific Bases of Colorado River Water Management*. I contributed to and reviewed National Academy of Sciences (NAS)/National Research Council- (NRC) Board on Atmospheric Sciences and Climate Report on *Earth-Atmosphere Interactions: Understanding and Responding to Multiple Environmental Stresses, Report of a Workshop.* I represented USGS on Climate Change Science Program Office (CCSP), US Government Review Subcommittee, Working Group I Contribution to Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report

1. **OTHER TECHNICAL ACTIVITIES:** NONE

15. OUTREACH AND INFORMATION TRANSFER (not updated past 2003)

Betancourt, J.L., Lixey, L. M., and Andrews, T.G. 1998. Packrat middens: Vegetation and Climate Variability in the Southwestern United States. NOAA World Data Center-A for Paleoclimatology, Educational Slide Project, Boulder, CO

Contributions to USGS-BRD, LUHNA Project Web Pages:
http://www.nbs.gov/luhna/southwest/southwest.html, http://www.cpluhna.nau.edu/

On matters of Southwestern U.S. drought, floods, fire, vegetation history of the Western U.S., I'm regularly interviewed by the media.). My work has also been featured by the prkint media, including *Science, Science News, Nature, Time, US News and World Report, Geo, Discovery, The New York Times, the Washington Post, the LA Times*, and regional newspapers (see enclosure). For some recent press releases and interviews, see:

http://wwwpaztcn.wr.usgs.gov/buffelgrass
http://wwwpaztcn.wr.usgs.gov/fire
http://www.uswaternews.com/archives/arcconserv/3newmex9.html
http://ewradio.org/program.aspx?ProgramID=3506
http://www.ncdc.noaa.gov/oa/climate/research/2003/jun/st042dv00pcp200306.html
http://www.usgs.gov/public/press/public_affairs/press_releases/pr1727m.html,
http://www.usgs.gov/public/press/public_affairs/press_releases/pr1494m.html,
http://www.msnbc.com/news/506581.asp?cp1=1,
http://www.spacedaily.com/news/earth-00h.html,
http://www.abqjournal.com/paperboy/ia/scitech/822903scitech01-10-03.htm,
http://www.abqjournal.com/scitech/1scitech01-21-00.htm
http://www.hcn.org/servlets/hcn.Article%3Farticle_id%3D11110
http://www.ee/lists/infoterra/1998/12/0025.html
http://www.hcn.org/servlets/hcn.Article?article_id=1763
http://www.unm.edu/~quantum/quantum_fall_1999/global.html

Over my career, I have given numerous talks to lay audiences, including local chapters of the Sierra Club, Audubon Society, and Nature Conservancy, Southern Arizona Native Plant Society and lecture series at public libraries and local high schools. I have also granted a number of field interviews for documentaries and science news programs, including German Science, WQED (Pittsburgh), Italian Radio TV, Quantum ABC-TV (Australia), BBC (Planet Earth Series), BBC (Richard Attenborough), and KUAT-TV (Tucson).

16. INVENTIONS, PATENTS HELD: None

17. HONORS, AWARDS, RECOGNITION, ELECTED MEMBERSHIPS

Fulbright Scholar- Argentina 1994
Department of Interior, Superior Service Award 1994
William Skinner Cooper Award, Ecological Society of America, August 2001 (with Tom Swetnam)
Department of Interior, Meritorious Service Award 2002
W.R. Boggess Award, American Water Resources Association, November 2005 (with Steve Gray and Steve Jackson)

18. BIBLIOGRAPHY

McCabe, G. J., Betancourt, J.L., Gray, S.T., and Palecki, M.A. In review. Associations of multidecadal sea surface temperature variability with U.S. drought. *International Journal of Climatology.*

Van de Water, P.K., Leavitt, S.W., Betancourt, J.L., Fischer, T., and Pedicino, L., and Fischer, T. In revision. Evaluation of $\delta^{13}C$ of *Atriplex* spp. leaf cellulose as a proxy for $\delta^{13}C$ of atmospheric CO_2 on time scales of decades to millennia. *Plant, Cell and Environment.*

Quade, J., Rech, J.A., Latorre, C.H., Betancourt, J.L., Gleeson, E., Arroyo, M.T.K. In revision. Soils at

the hyperarid margin: The isotopic composition of soil carbonate from the Atacama Desert. *Geochimica et Cosmochimica*.

Gray, S.T., Graumlich, L., Betancourt, J.L. In press. Annual precipitation in the Yellowstone National Park Region since A.D. 1173. *Quaternary Research.*

Hereford, R. and Betancourt, J.L. In press. Historic geomorphology of the San Pedro River: archival and physical evidence. In: Stromberg, J. and Tellman, B., Ed., *Ecology and Conservation of Desert Riparian Ecosystems: The San Pedro River Example*. University of Arizona Press, Tucson.

Holmgren, C., Norris, J., Betancourt, J. L. In press. Inferences about winter temperatures and summer rains from the late Quaternary record of C_4 perennial grasses and C_3 desert shrubs in the northern Chihuahuan Desert. *Journal of Quaternary Science*.

McCabe, G., Betancourt, J.L., Hidalgo, H.G. 2006. Associations of decadal to multidecadal sea-surface temperature variability with Upper Colorado River flow. *Journal of the American Water Resources Association* (In press).

Smith, F.A. and Betancourt, J.L. 2006. Predicting woodrat (*Neotoma*) responses to anthropogenic warming from studies of the paleomidden record. *Journal of Biogeography*. 33, 2061-2076.

Drees, K.P., Neilson, J.W., Betancourt, J.L., Quade, J., Henderson, D.A., Pryor, B., and Maier, R.M. 2006. Bacterial community structure of soils in a hyperarid region of the Atacama Desert. *Applied and Environmental Microbiology* 12, XXX-XXX.

Parks, J. A., Dean, J. S., and Betancourt, J. L. 2006. Tree rings, drought and the Pueblo abandonment of south-central New Mexico in the 1670s. D. E. Doyel and J. S. Dean, Eds., *Environmental Change and Human Adaptation in the Ancient Southwest*, University of Utah Press, p. 214-227.

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Gray, S.T., Betancourt, J.L., Jackson, S.T., Eddy, R. 2006. Role of multidecadal climate variability in a range extension of pinyon pine. *Ecology* 87, 1124-1130.

Latorre, C., Betancourt, J.L., and Arroyo, M.T.K. 2006. Vegetation and climate history of a perennial river canyon in the Rio Salado Basin (22 °S) of northern Chile. *Quaternary Research* 65, 450-466.

Norris, J.T., Jackson, S.T., and Betancourt, J.L. 2006. Classification tree and minimum-volume ellipsoid analyses of the distribution of ponderosa pine in the western USA. *Journal of Biogeography* Vol. 33, pp. 342-360.

Keeley, J.E., Allen, C.D., Betancourt, J.L., Chong, G.W., Fotheringham, C.J. and Safford, H.D. 2006. A 21st Century perspective on postfire seeding. *Journal of Forestry* March 2006, pp. 103-104.

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Gray, S. T., Jackson, S. T., and Betancourt, J. L. 2004. Tree-ring based reconstructions of interannual to decadal-scale precipitation variability for northeastern Utah since 1226 A.D. *Journal of the American Water Resources Association* v. 40, p. 947-960.

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Betancourt, J.L., 1977, Archeological survey of a proposed lignite mine area, the Shell-Rockdale Lease: Austin, Texas Historical Commission, Archeological Survey, v. 21, 117 p.

19. PUBLICATIONS (copies of your 3 most significant career publications)

Betancourt, J.L., Van Devender, T.R., and Martin, P.S., 1990, *Packrat middens: The last 40,000 years of biotic change*: Tucson, Arizona, University of Arizona Press, 467 p. (I also enclose several reviews of this book in *Science*, *Nature*, etc.).

Swetnam, T.R. and Betancourt, J.L., 1998, Mesoscale disturbance and ecological response to decadal climatic variability in the American Southwest. *Journal of Climate* 11: 3128-3147.

Betancourt, J. L., Latorre, C., Rech, J., Quade, J., Rylander, K.A. 2000. A 22,000-yr history of monsoonal precipitation in northern Chile's Atacama Desert. *Science* 289: 1542-1546.

The University of Arizona book is the definitive survey of late Quaternary environmental history in the arid interior of western North America. Released in July 1991, the book was reviewed in a wide array of journals (see enclosure), from *Science* and *Nature* to *Time* Magazine and *Natural History*. The reviews speak for themselves.

The *Journal of Climate* paper was awarded the 2001 William Skinner Cooper Award from Ecological Society of America. This paper resulted from long-term collaboration with my close colleague and best friend, Tom Swetnam (currently Director, Laboratory of Tree-Ring Research, Univ. of Arizona). On our front and back porches, accompanied by six packs and bored looks from our wives and kids, Tom and I have been talking for years about climatic synchronization of regional ecological phenomena at interannual to interdecadal scales. This paper is a synthesis of this long-term collaboration. The Cooper Award Committee's write-up (see enclosure) in the Bulletin of the Ecological Society of America is an apt description of the paper's impact.

I'm particularly proud of the 2000 *Science* paper on the paleoclimatic history of the Atacama Desert. The context and impact of this paper is described under Research Accomplishments.

20. POSITION DESCRIPTION

FACTOR I - THE RESEARCH ASSIGNMENT:

This position is located at the Research Project Office, Water Resources Division, National Research Program, Tucson, Arizona. The primary purpose of the position is to achieve a dynamic understanding of vegetation change and its relation to water resources in arid lands, and to do so in a manner appropriate to the hierarchy of spatial and temporal scales implicit in a study of global change.

The employee is considered a mature, productive scientist with a clear record of sustained research addressing problems of an interdisciplinary nature. These studies, which require a broad perspective, contribute significantly toward understanding linkages between hydrological, climatic and ecological processes.

The employee serves as project chief on basic and applied research on the linkage between climate, vegetation and hydrology in arid and semi-arid regions, including causal relations with large-scale (e.g., global) ocean-atmosphere interactions. The employee tests ecological process models driven by climatic variability using a mixture of paleocological, historical, and experimental data. The ultimate objective of the employee's research is to predict ecological and hydrological responses to large-scale climatic changes as well as changes resulting from human impacts. This research entails monitoring of vegetation plots, analysis of instrumental records, and development of proxy data for times and places where direct measurements are unavailable. Employee develops paleohydrologic information for the western United States to illustrate the influence of climate change on arid ecosystems; to anticipate how these ecosystems are apt to change in the future; and to test and validate outputs from global and mesocale circulation models. The employee's research will also address the impacts of climatic change and land use on the behavior of ephemeral streams, particularly as they relate to erosional regimes and flood hazards.

Anticipated research results will be of fundamental value to understanding change in arid ecosystems. The results will be published by employee in high visibility journals, in books and in Survey publications; employee, upon invitation, will present research results orally at national and international conferences, as well as at universities and programmatic agency gatherings.The employee serves as liaison between other agencies and the USGS on matters relating to terrestrial plant ecology, climatology, and paleohydrology. This includes orchestrating workshops that facilitate interdisciplinary interactions among international scientists and that strengthen institutional linkages in the arena of global change research.

FACTOR II - SUPERVISION RECEIVED:

The employee's immediate supervisor is the Chief, Branch of Regional Research, Western Region, who reviews completed work primarily for conformance with administrative policies and procedures. Employee has freedom at leading a research program while receiving no technical direction; employee has discretion to select and define fruitful areas of research. Employee serves as a mentor for project staff who, themselves, are evolving into mature and competent researchers. Employee also has the freedom to accept adjunct status at universities, when offered, and serve on master's and doctoral committees.

With wide latitude for independent action, the employee is solely responsible for allocation of resources within the project, planning specific objectives for project research, and selecting technical procedures. Employee demonstrates the ability to plan and conduct research successfully without technical review, resulting in publication in peer-reviewed literature and presentations at national and international conferences.

FACTOR III - GUIDELINES AND ORIGINALITY:

Employee demonstrates scientific creativity in several of his fields of interest. One sign of such creativity is publication of research in technical journals with interdisciplinary audiences and broad circulations. Another sign is establishing new linkages between physical and biological phenomena that require blending approaches from several disciplines. Such contributions may be recognized in application of new perspectives or methodologies in the missions of other government agencies or media attention showing that the research is of wide public interest.

Guidelines include previous reports, technical journals and established procedures. Employee uses independent judgment in adapting these guidelines to field and laboratory studies or improvising new ones where necessary. Much of the research is novel and requires definition and publication of original approaches that have developed concurrently with discovery of new sources of information. Employee is also expected to apply broad academic and professional experience to produce new insights and perspectives that, otherwise, may be overlooked by specialists in the relevant fields.

FACTOR IV - QUALIFICATIONS AND SCIENTIFIC CONTRIBUTIONS:

Employee has demonstrated competence in various fields of interest and his work is recognized on a national scale. The resulting body of work is extensive in scope and content. Employee plays a leadership role in the Survey's activities concerning global change, is asked to review journal articles and grant proposals routinely, and receives frequent invitations to address universities and professional societies and to serve on advisory and technical review committees.

The employee has a professional knowledge of a wide range of concepts, principles, and practices in the fields of ecology, climatology, hydrology, and geology gained through extended study and experience, and in applying this knowledge to a variety of field situations and to analyses of data. Employee is expected to author subject reports for publication in USGS series, scientific journals, or books. The employee maintains awareness of ongoing research and recent development in related fields by reading technical literature, participating in professional societies, attending professional meetings, and developing professional contacts with his peers. In addition, employee serves as a consultant to Division, Branch, and Project Chiefs, and as technical advisor to other scientists in his areas of specialized knowledge. Employee serves as one of two Research Advisors for WRD ecologists.

CURRICULUM VITAE

NAME**:** **HENRY F. DIAZ**

TITLE: **Research Meteorologist**

PLACE OF WORK: Earth System Research Laboratory
National Oceanic and Atmospheric Administration
325 Broadway, Boulder, Colorado 80305

EDUCATION:

Bachelor of Science	(1971)	Florida State University (Meteorology)
Master of Science	(1974)	University of Miami (Atmospheric Science)
Ph.D.	(1985)	University of Colorado (Geography/Climatology)

PROFESSIONAL EMPLOYMENT:

June 1974 - May 1975: Center for Experiment Design and Data Analysis, Environmental Data Service, National Oceanic and Atmospheric Administration (NOAA, U.S. Dept. of Commerce, Washington, DC.
July 1975 - September 1983: National Climatic Center, Environmental Data and Information Service, NOAA, Asheville, NC. (Detailed to NOAA/ERL Sept. 1981 -Sept. 1983).
October 1983 - August 1986: Climate Research Program, Environmental Sciences Group, NOAA/ERL, Boulder, CO (*Acting Director*, January 1984 - August 1986).
September 1986 - December 1989: Climate Research Division, Air Resources Laboratory, NOAA/ERL, Boulder, CO.
December 1989 - September 1993: Climate Research Division, Climate Monitoring and Diagnostics Laboratory, NOAA/ERL, Boulder, CO.
October 1993 to September 2005: Climate Diagnostics Center, NOAA/OAR, Boulder, CO.
October 2005 to present: Earth System Research Laboratory, NOAA, Boulder, CO

AWARDS, MEMBERSHIPS IN PROFESSIONAL SOCIETIES AND OTHER RECOGNITION:

Memberships

American Meteorological Society
American Geophysical Union
AMS Committee on Climate Variations (1982–87)
AMS Committee on Applied Climatology (1991–93)

Publications Committee of the *Journal Arctic and Alpine Research*
Editorial Board of the *Journal Arctic and Alpine Research* (now the *Journal of Arctic, Antarctic, and Alpine Research*)
Editorial Board of the *International Journal of Climatology*.

Fellow of the Cooperative Institute for Research in Environmental Science (CIRES), University of Colorado (Boulder): 1987–2004
Associate Director, CIRES Atmospheric & Climate Dynamics Division (1997–1999).
CIRES Executive Committee
Adjunct Associate Professor in the Department of Geography, University of Colorado (Boulder): 1989/90 to present
Intergovernmental Panel on Climate Change (IPCC), Working Group I, Climate Observations and Trends Reports: 1990, 1992 & 1995.
4 Ph.D. Dissertation, 2 M.S. Thesis Committees at CU-Boulder, and 1 M.S. Thesis Committee in the Department of Geology and Geography at the University of Massachusetts.

Awards and Other Recognition:

NOAA awards for Outstanding Achievement (May 1977, 1983)
NOAA awards for Sustained Superior Performance (May 1978, July 1988, June 1989, 1992, 1993).
NOAA Administrator's Award, May 2004
NOAA fulltime scholarship to the University of Colorado (1980)
Visiting Scientist, Climate Research Group, Scripps Institution of Oceanography, La Jolla, CA (Summer 1982)
Visiting Scientist at the University of Massachusetts, Amherst (September 1988 to June 1989)
Visiting Scientist, Institute of Geography, Swiss Federal Institute of Technology (ETH), Zurich, Switzerland (Summer 1994)
Summer Visiting Scientist (1998) IGBP/PAGES Project Office
Visiting Scientist, Climate Research Division, Scripps Institution of Oceanography, La Jolla, CA (2000)
Visiting Scientist, Desert Laboratory, University of Arizona (Spring 2002)
Visiting Scientist, Tree-Ring Laboratory, University of Arizona (January-May 2004)
Visiting Scientist, Bermuda Biological Station for Research (August-October 2005)
NOAA IPA Assignment to the University of Arizona (January-September 2006)

CURRENT AND PREVIOUS GRANTS AND OTHER RESEARCH FUNDING SUPPORT:

U.S. Department of Energy (DOE) Contract DE-ACO2-81EV10739 (August 1981 -August 1984, $408.6K) with R. S. Bradley, P. M. Kelly and P. D. Jones, "The Climate of the Northern Hemisphere, 1851-1900, Compared to Contemporary Climate."
National Science Foundation (NSF) Grant ATM-8208677 (January 1983 - June 1985, $91.2K) with J. T. Andrews and S. K. Short, "A Comparison of Modern Summer Climate Variations in the North American Arctic with Reconstructed Temperature Changes Based on Pollen Data."
DOE Contract Supplement (Extension of DOE Contract DE-ACO2-81EV10739), August 1984 - December 1984, $14.3 K.
National Oceanic and Atmospheric Administration (NOAA), Equatorial Pacific Ocean Climate Studies (EPOCS) (October 1984 - September 1986, $75.5K) with C.S. Ramage, "Analysis of Ocean Station Vessels (OSV) and Parallel-OSV Merchant COADS Subsets."
NOAA/EPOCS (October 1984 - September 1985, $13K) with C.S. Ramage, "Support of Real-Time Monitoring of Climate Indices."
DOE Contract DE-FGO2-85ER60316 (February 1985 - November 1988, $484K) with R.S. Bradley, P. M. Kelly and P. D. Jones, "Studies of Climatic Variability During the Period of Instrumental Records."

NOAA/EPOCS (October 1985 - September 1986, $41.9K) with C. S. Ramage, "Real Time Monitoring, Evaluation and Testing of ENSO Precursors."

NOAA/EPOCS (October 1986 - September 1987, $24.2K) with K. Weickmann, O.Garcia and R. Slutz, "Real Time Monitoring, Evaluation and Testing of ENSO Precursors."

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18. Diaz, H.F. and T.J. Brown, 1993: An objective classification of climatic regions in the Pacific and Indian Oceans. In: K.T. Redmond and V. L. Tharp (eds.), *Proceedings of the Ninth Annual Pacific Climate (PACLIM) Workshop, April 21-24, 1992*,, Calif. Dept. of Water Resources, IESP Tech. Rept. 34, pp. 55-62.
19. Kiladis, G. N. and H.F. Diaz, 1993: Precipitation variability over northern Mexico during the last 90 years. In: K.T. Redmond and V. L. Tharp (eds.),*Proceedings of the Ninth Annual Pacific Climate (PACLIM) Workshop, April 21-24, 1992*, K.T. Redmond (ed.), Calif. Dept. of Water Resources, IESP Tech. Rept. 34., pp. 63-70.
20. Diaz, H. F. and T. R. Karl (eds.), 1994: *Information Needs for Precipitation-Sensitive Systems*, Workshop Report (NOAA's Environmental Watch Report 94.1).

Book Reviews

Diaz, H. F. (1985): Review of *Climatic Change on a Yearly to Millennial Basis*, N.-A. Mörner and W. Karlen, Eds., *Bull. Amer. Meteor. Soc.*, **66**, p. 682.

Diaz, H. F. (1989): Review of *Water and Arid Lands of the Western United States*, M. El-Ashry and D. Gibbons, Eds., *Environ. Management*, **13**, 809-811.

Diaz, H.F. (1990): Review of *Global Climate Change: Human and Natural Influences*, S. F. Singer, Ed., *Bull. Amer. Meteor. Soc.*, **71**, 1034-1036.

Conferences Organized

Workshop on *Problems and Prospects for Forecasting Great Salt Lake Levels*. Salt Lake City, UT, March 26-28, 1985.

Workshop on *Paleoclimatic Aspects of El Niño/Southern Oscillation*. Boulder, CO, May 2-4, 1990.

Workshop on *Reconstruction of Spatial Patterns of Climatic Anomalies During the Medieval Warm Period (A.D. 900–1300)*. Tucson AZ., November 5-8, 1991.

International COADS Workshop. Boulder, CO, January 13-15, 1992.

Workshop on *Environmental Information Needs for Precipitation-Sensitive Systems*, Boulder, CO, May 4-6, 1993.

International COADS Winds Workshop. Kiel, Germany, May 31-June 2, 1994.

Workshop on *Atlantic Hurricane Variability on Decadal Time Scales: Nature, Causes and Socio-Economic Impacts*. Coral Gables, FL, February 9-10, 1995.

Workshop on *Climatic Change at High Elevation Sites*. Wengen, Switzerland, September 11-15, 1995.

Workshop on *Monitoring for Climatic Change in the Americas*. Viña del Mar, Chile, December 5-8, 1995.

Workshop on *Climatic Changes and Human Health Linkages in the Tropical Americas*. Belize, Central America, May 4-6, 1997.

International Workshop on *Digitization and Preparation of Historical Surface Marine Data and Metadata*. Seville, Spain, September 15-17, 1997.

International Workshop on *Calibration of Historical Data for Climatic Reconstruction*, Barcelona, Spain, July 6-8, 1998.

International Conference on *Reconstructing Climatic Variability from Historical Sources and Other Proxy Records*. Manzanillo, Mexico, December 1–3, 1999.

Symposium on *Impacts of Climatic Variations on Water Resources: A Focus on Border Regions*, Santa Barbara, California July 16–20, 2000.

Second Conference on *Climatic Change at High Elevation Sites (HIGHEST II): Emerging Impacts*. Davos, Switzerland, 25–28 June 2001.

International Conference on the *The Hadley Circulation: Present, Past and Future*, Honolulu, Hawaii, November 12–15, 2002.

Workshop on *Climate Variability and Water Resources Management in the US-Mexico Border Region*, La Paz, BCS, Mexico, January 14–16, 2003.

Mountain Climate Sciences Symposium, North Lake Tahoe, May 25-27, 2004.

First Mountain Climate Workshop, Pray, Montana, March 1–4, 2005.

Workshop on *Climate and Cultural History in the Americas*, Akumal, Mexico, March 31–April 2, 2005.

Workshop on *Assessing, Modeling, and Monitoring the Impacts of Extreme Climate Events*, Hamilton, Bermuda, October 13–14, 2005.

Second Mountain Climate Workshop, Mount Hood, Oregon, September 2006.

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INTERESTS AND EXPERTISE:

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EDUCATION:

1. B.S. (Biology) University of Tulsa, 1994
2. M.S. (Botany) University of Oklahoma, 1998
3. Ph.D. (Botany) University of Wyoming, 2003

PROFESSIONAL EXPERIENCE:

2006-Present Associate Research Scientist, Department of Civil and Architectural Engineering, University of Wyoming
Director, Wyoming Water Resources Data System
Wyoming State Climatologist
2006 Adjunct Assistant Professor, Laboratory of Tree-ring Research, University of Arizona
2004-2006 National Research Council Post-Doctoral Research Associate, Desert Laboratory, U.S. Geological Survey
2003-2004 Post-Doctoral Research Associate, Big Sky Institute, Montana State University
1998-2003 Graduate Research and Teaching Assistant, Department of Botany, University of Wyoming
1997-1998 Research Associate, Mapping and Geographic Information Systems, Oklahoma Natural Heritage Inventory and Oklahoma Biological Survey
1995-1998 Teaching Assistant, Department of Botany and Microbiology, University of Oklahoma

SELECTED HONORS AND AWARDS:

1. **2005 William R. Boggess Award** for "The Most Outstanding Paper Published in 2004", American Water Resources Association
2. **2004 Outstanding Past Dissertation Award,** The Graduate School, University of Wyoming
3. **2000 Award for Outstanding Teaching in Botany,** Department of Botany, University of Wyoming

1. **1997 George L. and Cleo Cross Endowed Scholarship Award** for "Outstanding Academic Achievements", University of Oklahoma

TECHNICAL PUBLICATIONS:

In Progress or Review

Betancourt, J.L., S.T. Jackson, **S.T. Gray,** M.E. Lyford and J.R. Norris. 2006. Natural plant invasions in the Central Rockies: Model systems at the interface of ecology and paleoecology. *Frontiers in Ecology and the Environment* (In Prep.).

Gray, S.T., L.J. Graumlich, and J.L. Betancourt. 2006. Annual precipitation in the Yellowstone National Park Region since A.D. 1173. *Quaternary Research* (In Press).

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Jackson, S.T., J.L. Betancourt, M.E. Lyford, **S.T. Gray** and K.A. Rylander. 2005. A 40,000-year woodrat-midden record of vegetational and biogeographic dynamics in northeastern Utah. *Journal of Biogeography* 32:1085-1106.

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Pederson, G.T, Fagre, D.B., **Gray, S.T.** and Graumlich, L.J. 2004. Decadal-scale climate drivers for glacial mass balance in Glacier National Park, Montana, USA. *Geophysical Research Letters*, 31:L12203, doi:10.1029/2004GL019770.

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Gray, S.T., J.L. Betancourt, C.L. Fastie and S.T. Jackson. 2003. Patterns and sources of multidecadal oscillations in drought-sensitive tree-ring records from the central and southern Rocky Mountains. *Geophysical Research Letters*, 30:491-494, doi:10.1029/2002GL016154.
Lyford, M.E., Jackson, S.T., Betancourt, J.L. and **Gray, S.T.** 2003, Influence of landscape structure and climate variability in a late Holocene natural invasion. *Ecological Monographs*, 73:567-583.

OTHER PUBLICATIONS:

Gray, S.T. 2004. "Long-term perspectives on Wyoming drought: lessons from the tree-ring record." Pp. 97-101, in J. Curtis and K. Grimes, eds. *Wyoming Climate Atlas*.
Gray, S.T. 2003. *Long-term climate variability and its implications for ecosystems and natural resource management in the central Rocky Mountains.* Ph.D. Dissertation, University of Wyoming.

1. Wallace, L.L. and **S.T. Gray**. 2001. "Feedbacks between organisms and ecosystem processes." In S.E. Gergel and M.G. Turner, eds. *Learning landscape ecology: A practical guide to concepts and techniques.* Springer-Verlag.
2. **Gray, S.T.** 1998. *Factors controlling forest expansion in a mixed-grass prairie.* Master's Thesis, University of Oklahoma.
3. Hoagland, B.W., F.L. Johnson and **S.T. Gray**. 1997. *Vegetation Study of the Chickasaw National Recreation Area.* National Park Service, Sulfur, OK.

INVITED PAPERS FROM SCIENTIFIC MEETINGS:

2006 McCabe, G.J., J.L. Betancourt, **S.T. Gray**, M.A. Palecki, and H.G. Hidalgo. Decadal-to-Multidecadal (D2M) Variability in Global SSTs and North American Hydroclimate: An Update and Prospectus for Paleoscience. American Quaternary Association (AMQUA).

2005 **Gray, S.T.**, J.L. Betancourt and S.T. Jackson. Nonlinear interactions among climate, landscape structure, and plant migration. *Ecological Society of America.*

2005 **Gray, S.T.,** J.L. Betancourt, C.A. Woodhouse and D.M. Meko. Paleo perspectives on extreme climatic variability in the mountains of western North America. *Mountain Climate Workshop-MTNCLIM*.

2004 **Gray S.T.** and L.J. Graumlich. Reconciling natural, multi-decadal climate variability and predictions of anthropogenic climate change in the western U.S. *American Association for the Advancement of Science, Pacific Division.*

CONTRIBUTED PAPERS FROM SCIENTIFIC MEETINGS:

2006 G. McCabe, J.L. Betancourt, **S.T. Gray**, M. Palecki and H.H. Hidalgo. Associations of Multi-Decadal Sea Surface Temperature Variability with U.S. Drought. *Pacific Climate Workshop (PACLIM).*

2006 **Gray, S.T.**, G.T. Pederson, L.J. Graumlich and J.L. Betancourt. New Approaches for Extracting Climatic Signals from Long Duration Tree-ring Records. *Association of American Geographers.*

2005 **Gray, S.T.**, G.T. Pederson, L.J. Graumlich and J.L. Betancourt. Disentangling the climate/growth signal millennial Pinus chronologies from the northern Rocky Mountains, USA. *American Geophysical Union.*

2005 Pederson, G.T., **S.T. Gray**, C.A. Woodhouse and T. Kipfer. The Past Climate Variability and Impacts (PCVI) Clearinghouse. *American Geophysical Union.*

2005 **Gray, S.T.** and J.L. Betancourt. The relationship between reconstructed PDO, AMO and North

American drought patterns: Implications for proxy development. *Association of American Geographers.*

2005 Pederson G.T., D.B. Fagre, **S.T. Gray** and L.J. Graumlich. 2005. Fire and Ice: Understanding the Legacy of the Little Ice Age for Contemporary Landscape Patterns and Processes in Glacier National Park, Montana, USA. *Association of American Geographers.*

2005 **Gray, S.T.** and J.L. Betancourt. Assessing the importance of decadal-to-multidecadal (D2M) climate variability in forecasting ecological and hydrologic change across the Interior West. 5th National Conference on Science, Policy and Environment: *Forecasting Environmental Changes.*

2004 Betancourt, J.L., S.T. Jackson, **S.T. Gray**, M.E. Lyford and J.R. Norris. Vegetation dynamics in the arid West: Past, present and future. *Mountain Climate Sciences Symposium.*

2004 Graumlich, L.J., G.T. Pederson, D.B. Fagre and **S.T. Gray.** Mountain systems, persistent drought and the vulnerability of ecosystem services: A Case Study from Glacier National Park, USA. *American Geophysical Union.*

2004 **Gray, S.T.** and L.J. Graumlich. Patterns, sources and impacts of multidecadal precipitation variability in the Rocky Mountain West. *Mountain Climate Sciences Symposium.*

2004 **Gray, S.T.**, L.J. Graumlich and G.T. Pederson. Linking low-frequency climate variability, ecosystem structure and hydrologic processes in the Rocky Mountain West. *Tree Rings and Climate: Sharpening the Focus, University of Arizona.*

2004 **Gray, S.T.**, L.J. Graumlich, G.T. Pederson, D.B. Fagre, J.L. Betancourt, J.R. Norris and S.T. Jackson. Paleo-environmental perspectives on climate-change monitoring in the National Parks of the northern U.S. Rocky Mountains. *American Geophysical Union.*

2004 Pederson, G.T., D.B. Fagre, **S.T. Gray** and L.J. Graumlich. Linking regional decadal-scale drivers of snowpack to local summer drought: paleo-perspectives on glacier mass balance in Glacier National Park, Montana. *Tree Rings and Climate: Sharpening the Focus, University of Arizona.*

2003 **Gray, S.T.**, L.J. Graumlich, and J.L. Betancourt. The Atlantic Basin as a source for North American drought: new perspectives from proxy climate networks. *American Geophysical Union.*

2003 **Gray, S.T.**, S.T. Jackson, and J.L. Betancourt. Tree-ring based reconstructions of precipitation variability in northeastern Utah. *Pacific Climate Workshop (PACLIM).*

2002 **Gray, S.T.**, S.T. Jackson and C.L. Fastie. Use of paleo-climate proxy data to enhance drought planning and response. *Pacific Climate Workshop (PACLIM).*

2001 Lyford, M.E., S.T. Jackson, **S.T. Gray**, K.G. Gerow and R.G. Eddy. Comparisons of modern woodrat (*Neotoma cinerea*) midden assemblages with surrounding vegetation. *Ecological Society of America.*

2001 **Gray, S.T.**, C.L. Fastie, S.T. Jackson, J.L. Betancourt and K. Taylor. 1,000 year drought records from tree-rings in the Bighorn Basin, Wyoming. *Ecological Society of America.*

2000 **Gray, S.T.**, C.L. Fastie, S.T. Jackson, and J.L. Betancourt. Dendroclimatological proxies for drought and circulation indices from the lower forest margin in north central Wyoming, USA. *American Geophysical Union.*

2000 Jackson, S.T., J.L. Betancourt, M.E. Lyford, and **S.T. Gray**. Late Quaternary vegetation history of the Flaming Gorge region, Utah/Wyoming. *Ecological Society of America.*

2000 **Gray, S.T.**, S.T. Jackson and J.L. Betancourt. Rates and dynamics of Utah juniper (*Juniperus osteosperma*) invasion in arid shrublands. *Ecological Society of America.*

2000 S.T. Jackson, **S.T. Gray**, M.E. Lyford, J.L. Betancourt and C.L. Fastie. Patterns and dynamics of Utah juniper expansion in Wyoming: a multiscale project. *Society for Range Management.*

2000 **Gray, S.T.**, S.T. Jackson and J.L. Betancourt. Modeling the potential distribution of

Utah Juniper in Wyoming. *Society for Range Management.*

1999 **Gray, S.T.**, S.T. Jackson and J.L. Betancourt. Modeling climatic and edaphic controls on regional Utah juniper (*Juniperus osteosperma*) distributions. *Ecological Society of America.*

1998 Hoagland, B.W., **S.T.Gray** and F.L. Johnson. Vegetation mapping in a grassland-forest masaic, Arbuckle Mountains, south-central Oklahoma. *Ecological Society of America.*

1998 **Gray, S.T.** and L.L. Wallace. Factors affecting patterns of forest expansion in a mixed-grass prairie. *Ecological Society of America.*

1997 **Gray, S.T.** and L.L. Wallace. Land-use and landscape structure changes in the Wichita Mountains of Oklahoma. *Ecological Society of America.*

1997 Hoagland, B.W., **S.T. Gray**, and F.L. Johnson. Vegetation classification and mapping of a grassland-forest mosaic in south-central Oklahoma. *International Association of Vegetation Scientists.*

INVITED PRESENTATIONS:

Gray, S.T. **Impacts of climate variability and climate change on semi-arid vegetation.** *Eastern Nevada Landscape Coalition Annual Workshop, Ely, Nevada. June 16, 2006.*

Gray, S.T. **Long-term perspectives on climate variability and climate-change impacts: implications for wilderness management.** *USDA-Forest Service Region Four Integrated Resource Mangement Workshop, Ogden, Utah. March 30, 2006.*

Gray, S.T. **Fits and starts: nonlinear dynamics in plant migration.** *University of Washing, Climate Impacts Group, Seattle, Washington. November 8, 2005.*

Gray, S.T. **Drought in the Upper Colorado River Basin: lessons from thirty years of tree-ring Research.** *The Water Education Foundation, Colorado River Symposium, Santa Fe, New Mexico. September 28, 2005.*

Gray, S.T. **Long-term perspectives on extreme climatic events in the southwestern U.S.** *Sandia National Laboratories, Albuquerque, New Mexico. April 7, 2005.*

Gray, S.T. **Updated reconstructions of Colorado River flow.** *Department of the Interior, U.S.-Mexico Field Coordinating Committee Meeting, Tucson, Arizona. May 24, 2005.*

Gray, S.T. **Tree rings, oceans and drought: Long-term perspectives on western U.S. climate.** *Annual Bureau of Land Management Western Regional Leadership Meeting, Boise, Idaho. November 11, 2004.*

Gray, S.T. **Living with non-stationary climates in western North America.** *Laboratory of Tree-Ring Research, Tree-Ring Talks, University of Arizona.* October 26, 2004.

Gray, S.T. **The scientists' overview: Long-term climate variability and its implications for ecosystems and natural resource management on the Colorado Plateau.** *7th Biennial Conference of Research on the Colorado Plateau-Clients'Day, Northern Arizona University.* November 3, 2003.

Gray, S.T. **Long-term perspectives on climate variability in the Rocky Mountain West.** *Ecology Lecture Series, Montana State University.* October 16, 2003.

Gray, S.T. **Tree-ring based reconstructions of precipitation variability in the Bighorn Basin region over the past 750 years.** *Wyoming Water Development Commission, Wind/Bighorn Basin Advisory Group Meeting, Cody, Wyoming.* April 1, 2003.

Gray, S.T. **Tree-ring based reconstructions of precipitation variability in southwestern Wyoming over the past 750 years.** *Wyoming Water Development Commission, Green River Basin Advisory Group Meeting, Rock Springs, Wyoming.* March 25, 2003.

Gray, S.T. 2002. **Climate variability and tree-rings.** *Fall Research Series, Medicine Bow National Forest, Laramie, Wyoming.* October 19, 2002.

Gray, S.T. 2002. **Planning for droughts in the Central Rockies: lessons from the tree-ring record.** *Laboratory of Tree-Ring Research, Tree-Ring Talks, University of Arizona.* May 10, 2002.

Gray, S.T. 2002. **A paleo-history of droughts in western Wyoming.** *Governor's Drought Management Task Force, State of Wyoming.* March 19, 2002.

REPRESENTATIVE FUNDING:

2006 National Oceanic and Atmospheric Administration, Climate Change Detection and Data Program (Co-PI with T. Piechota and G. Tootle). "*Evaluation of Western U.S. Hydrologic Drought using Reconstructed Streamflow and Snowpack."* (In Review, Requesting $279,000).

2006 National Oceanic and Atmospheric Administration, Climate Change Detection and Data Program (Co-PI C. Woodhouse and others**).** "*Interpreting and Refining the Climate Signal in Millennial-Length 5-Needle Pine Chronologies."* (In Review, Requesting $115,00).

2006 National Science Foundation, Geography and Regional Science Program (Co-investigator with L.G. Graumlich and others). "*A novel approach for improving records of long-term, multi-scale snowpack variability in western North America."* ($98,000).

2006 National Park Service. *"Linking the monitoring of climate and ecosystems in the Greater Yellowstone Region."* ($21,000).

2004-2006 National Research Council-Research Associate Program, U.S. Geological Survey Post-Doctoral Research Award. "*Assessing the Importance of Low-Frequency Climate Variability in Forecasting Ecological and Hydrologic Change Across the Rocky Mountain West."* ($157,000).

2004 National Park Service-Greater Yellowstone Network, Inventory and Monitoring Program. *"Development of climate-monitoring protocols for the Greater Yellowstone Network."* ($40,000).

2001-2003 U.S. Geological Survey-Wyoming Water Development Commission Water Research Program (Co-investigator with S.T. Jackson). *"Combining modern and paleo-techniques for improved drought prediction and response."* ($57,479)

2000 University of Wyoming-National Park Service Research Station (Co-investigator with S.T. Jackson). *"Tree-ring based reconstructions of climate variability in the eastern Yellowstone Region."* ($4,500)

PROFESSIONAL SERVICE:

Program committee for the 2006 Annual Meeting of The American Quaternary Association.

Co-organizer, Workshop on Climate Change and Wilderness Areas, World Wilderness Congress 2005.

Lead organizer, Workshop on Climate Change and Natural Resource Management, 2005 Mountain Climate Symposium-MTNCLIM.

Reviewer for *Journal of Climate, Quaternary Research, Global Change Biology, Journal of the American Water Resources Association, International Journal of Climatology, Canadian Journal of Water Resources, Southwest Naturalist,* and *Ecological Applications.*

Graduate Student Representative to the Faculty, Department of Botany, University of Wyoming (2001/2002).

PROFESSIONAL MEMBERSHIPS:

American Association of State Climatologists
American Geophysical Union
Association of American Geographers
Ecological Society of America

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Climatology and hydrology (instrumental and paleo) • Water resources and land management • Global change • Biogeography • Modeling of physical and ecological systems • Human-environment interactions

EDUCATION:

4. B.S. (Biology) University of Tulsa, 1994
5. M.S. (Botany) University of Oklahoma, 1998
6. Ph.D. (Botany) University of Wyoming, 2003

PROFESSIONAL EXPERIENCE:

2006-Present Associate Research Scientist, Department of Civil and Architectural Engineering, University of Wyoming
Director, Wyoming Water Resources Data System
Wyoming State Climatologist
2006 Adjunct Assistant Professor, Laboratory of Tree-ring Research, University of Arizona
2004-2006 National Research Council Post-Doctoral Research Associate, Desert Laboratory, U.S. Geological Survey
2003-2004 Post-Doctoral Research Associate, Big Sky Institute, Montana State University
1998-2003 Graduate Research and Teaching Assistant, Department of Botany, University of Wyoming
1997-1998 Research Associate, Mapping and Geographic Information Systems, Oklahoma Natural Heritage Inventory and Oklahoma Biological Survey
1995-1998 Teaching Assistant, Department of Botany and Microbiology, University of Oklahoma

SELECTED HONORS AND AWARDS:

4. **2005 William R. Boggess Award** for "The Most Outstanding Paper Published in 2004", American Water Resources Association
5. **2004 Outstanding Past Dissertation Award,** The Graduate School, University of Wyoming
6. **2000 Award for Outstanding Teaching in Botany,** Department of Botany, University of Wyoming
2. **1997 George L. and Cleo Cross Endowed Scholarship Award** for "Outstanding Academic Achievements", University of Oklahoma

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In Progress or Review

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Gray, S.T., L.J. Graumlich, and J.L. Betancourt. 2006. Annual precipitation in the Yellowstone National Park Region since A.D. 1173. *Quaternary Research* (In Press).

Pederson, G.T., **S.T. Gray** and A.G. Bunn. 2006. A wavelet decomposition approach for analyzing long-term trends in drought sensitive tree-ring records. *International Journal of Climatology* (In Prep.).

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Gray, S.T., J.L. Betancourt, S.T. Jackson and R.G. Eddy. 2006. Roll of multidecadal climate variability in a range extension of pinyon pine. *Ecology* 87:1124-1130.

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2005

Gray, S.T. 2005. *Climate Monitoring Protocols for the Greater Yellowstone Network.* National Park Service, Bozeman, Montana. 93 pp.

Jackson, S.T., J.L. Betancourt, M.E. Lyford, **S.T. Gray** and K.A. Rylander. 2005. A 40,000-year woodrat-midden record of vegetational and biogeographic dynamics in northeastern Utah. *Journal of Biogeography* 32:1085-1106.

2004

Gray, S. T., Fastie, C., Jackson, S. T., and Betancourt, J. L. 2004. Tree-ring based reconstructions of precipitation in the Bighorn Basin, Wyoming since A.D. 1260. *Journal of Climate*, 17:3855-3865.

Gray, S. T., Jackson, S. T. and J.L. Betancourt. 2004. Tree-ring based reconstructions of interannual to decadal-scale precipitation variability for northeastern Utah. *Journal of the American Water Resources Association,* 40:947-960.

Gray, S.T., L.J. Graumlich, J.L. Betancourt, and G.D. Pederson. 2004. A tree-ring based reconstruction of the Atlantic Multidecadal Oscillation since 1567 A.D. *Geophysical Research Letters,* 31:L12205, doi:10.1029/2004GL019932.

Lyford, M.E., Jackson, S.T., **Gray, S.T.**, and R.G. Eddy. 2004. Validating the use of woodrat (Neotoma) middens for documenting natural invasions. *Journal of Biogeography*, 31:333-342.

Pederson, G.T, Fagre, D.B., **Gray, S.T.** and Graumlich, L.J. 2004. Decadal-scale climate drivers for glacial mass balance in Glacier National Park, Montana, USA. *Geophysical Research Letters*, 31:L12203, doi:10.1029/2004GL019770.

2003

Gray, S.T., J.L. Betancourt, C.L. Fastie and S.T. Jackson. 2003. Patterns and sources of multidecadal oscillations in drought-sensitive tree-ring records from the central and southern Rocky Mountains. *Geophysical Research Letters*, 30:491-494, doi:10.1029/2002GL016154.

Lyford, M.E., Jackson, S.T., Betancourt, J.L. and **Gray, S.T.** 2003, Influence of landscape structure and climate variability in a late Holocene natural invasion. *Ecological Monographs*, 73:567-583.

OTHER PUBLICATIONS:

Gray, S.T. 2004. "Long-term perspectives on Wyoming drought: lessons from the tree-ring record." Pp. 97-101, in J. Curtis and K. Grimes, eds. *Wyoming Climate Atlas*.
Gray, S.T. 2003. *Long-term climate variability and its implications for ecosystems and natural resource management in the central Rocky Mountains.* Ph.D. Dissertation, University of Wyoming.

4. Wallace, L.L. and **S.T. Gray**. 2001. "Feedbacks between organisms and ecosystem processes." In S.E. Gergel and M.G. Turner, eds. *Learning landscape ecology: A practical guide to concepts and techniques.* Springer-Verlag.
5. **Gray, S.T.** 1998. *Factors controlling forest expansion in a mixed-grass prairie.* Master's Thesis, University of Oklahoma.
6. Hoagland, B.W., F.L. Johnson and **S.T. Gray**. 1997. *Vegetation Study of the Chickasaw National Recreation Area.* National Park Service, Sulfur, OK.

INVITED PAPERS FROM SCIENTIFIC MEETINGS:

2006 McCabe, G.J., J.L. Betancourt, **S.T. Gray**, M.A. Palecki, and H.G. Hidalgo. Decadal-to-Multidecadal (D2M) Variability in Global SSTs and North American Hydroclimate: An Update and Prospectus for Paleoscience. American Quaternary Association (AMQUA).

2005 **Gray, S.T.**, J.L. Betancourt and S.T. Jackson. Nonlinear interactions among climate, landscape structure, and plant migration. *Ecological Society of America.*

2005 **Gray, S.T.,** J.L. Betancourt, C.A. Woodhouse and D.M. Meko. Paleo perspectives on extreme climatic variability in the mountains of western North America. *Mountain Climate Workshop-MTNCLIM*.

2004 **Gray S.T.** and L.J. Graumlich. Reconciling natural, multi-decadal climate variability and predictions of anthropogenic climate change in the western U.S. *American Association for the Advancement of Science, Pacific Division.*

CONTRIBUTED PAPERS FROM SCIENTIFIC MEETINGS:

2006 G. McCabe, J.L. Betancourt, **S.T. Gray**, M. Palecki and H.H. Hidalgo. Associations of Multi-Decadal Sea Surface Temperature Variability with U.S. Drought. *Pacific Climate Workshop (PACLIM).*

2006 **Gray, S.T.**, G.T. Pederson, L.J. Graumlich and J.L. Betancourt. New Approaches for Extracting Climatic Signals from Long Duration Tree-ring Records. *Association of American Geographers.*

2005 **Gray, S.T.**, G.T. Pederson, L.J. Graumlich and J.L. Betancourt. Disentangling the climate/growth signal millennial Pinus chronologies from the northern Rocky Mountains, USA. *American Geophysical Union.*

2005 Pederson, G.T., **S.T. Gray**, C.A. Woodhouse and T. Kipfer. The Past Climate Variability and Impacts (PCVI) Clearinghouse. *American Geophysical Union.*

2005 **Gray, S.T.** and J.L. Betancourt. The relationship between reconstructed PDO, AMO and North American drought patterns: Implications for proxy development. *Association of American Geographers.*

2005 Pederson G.T., D.B. Fagre, **S.T. Gray** and L.J. Graumlich. 2005. Fire and Ice: Understanding the

Legacy of the Little Ice Age for Contemporary Landscape Patterns and Processes in Glacier National Park, Montana, USA. *Association of American Geographers.*

2005 **Gray, S.T.** and J.L. Betancourt. Assessing the importance of decadal-to-multidecadal (D2M) climate variability in forecasting ecological and hydrologic change across the Interior West. 5th National Conference on Science, Policy and Environment: *Forecasting Environmental Changes.*

2004 Betancourt, J.L., S.T. Jackson, **S.T. Gray**, M.E. Lyford and J.R. Norris. Vegetation dynamics in the arid West: Past, present and future. *Mountain Climate Sciences Symposium.*

2004 Graumlich, L.J., G.T. Pederson, D.B. Fagre and **S.T. Gray.** Mountain systems, persistent drought and the vulnerability of ecosystem services: A Case Study from Glacier National Park, USA. *American Geophysical Union.*

2004 **Gray, S.T.** and L.J. Graumlich. Patterns, sources and impacts of multidecadal precipitation variability in the Rocky Mountain West. *Mountain Climate Sciences Symposium.*

2004 **Gray, S.T.**, L.J. Graumlich and G.T. Pederson. Linking low-frequency climate variability, ecosystem structure and hydrologic processes in the Rocky Mountain West. *Tree Rings and Climate: Sharpening the Focus, University of Arizona.*

2004 **Gray, S.T.**, L.J. Graumlich, G.T. Pederson, D.B. Fagre, J.L. Betancourt, J.R. Norris and S.T. Jackson. Paleo-environmental perspectives on climate-change monitoring in the National Parks of the northern U.S. Rocky Mountains. *American Geophysical Union.*

2004 Pederson, G.T., D.B. Fagre, **S.T. Gray** and L.J. Graumlich. Linking regional decadal-scale drivers of snowpack to local summer drought: paleo-perspectives on glacier mass balance in Glacier National Park, Montana. *Tree Rings and Climate: Sharpening the Focus, University of Arizona.*

2003 **Gray, S.T.**, L.J. Graumlich, and J.L. Betancourt. The Atlantic Basin as a source for North American drought: new perspectives from proxy climate networks. *American Geophysical Union.*

2003 **Gray, S.T.**, S.T. Jackson, and J.L. Betancourt. Tree-ring based reconstructions of precipitation variability in northeastern Utah. *Pacific Climate Workshop (PACLIM).*

2002 **Gray, S.T.**, S.T. Jackson and C.L. Fastie. Use of paleo-climate proxy data to enhance drought planning and response. *Pacific Climate Workshop (PACLIM).*

2001 Lyford, M.E., S.T. Jackson, **S.T. Gray**, K.G. Gerow and R.G. Eddy. Comparisons of modern woodrat (*Neotoma cinerea*) midden assemblages with surrounding vegetation. *Ecological Society of America.*

2001 **Gray, S.T.**, C.L. Fastie, S.T. Jackson, J.L. Betancourt and K. Taylor. 1,000 year drought records from tree-rings in the Bighorn Basin, Wyoming. *Ecological Society of America.*

2000 **Gray, S.T.**, C.L. Fastie, S.T. Jackson, and J.L. Betancourt. Dendroclimatological proxies for drought and circulation indices from the lower forest margin in north central Wyoming, USA. *American Geophysical Union.*

2000 Jackson, S.T., J.L. Betancourt, M.E. Lyford, and **S.T. Gray**. Late Quaternary vegetation history of the Flaming Gorge region, Utah/Wyoming. *Ecological Society of America.*

2000 **Gray, S.T.**, S.T. Jackson and J.L. Betancourt. Rates and dynamics of Utah juniper (*Juniperus osteosperma*) invasion in arid shrublands. *Ecological Society of America.*

2000 S.T. Jackson, **S.T. Gray**, M.E. Lyford, J.L. Betancourt and C.L. Fastie. Patterns and dynamics of Utah juniper expansion in Wyoming: a multiscale project. *Society for Range Management.*

2000 **Gray, S.T.**, S.T. Jackson and J.L. Betancourt. Modeling the potential distribution of Utah Juniper in Wyoming. *Society for Range Management.*

1999 **Gray, S.T.**, S.T. Jackson and J.L. Betancourt. Modeling climatic and edaphic controls on regional Utah juniper (*Juniperus osteosperma*) distributions. *Ecological Society of America.*

1998 Hoagland, B.W., **S.T.Gray** and F.L. Johnson. Vegetation mapping in a grassland-forest masaic, Arbuckle Mountains, south-central Oklahoma. *Ecological Society of America.*

1998 **Gray, S.T.** and L.L. Wallace. Factors affecting patterns of forest expansion in a mixed-grass prairie. *Ecological Society of America.*

1997 **Gray, S.T.** and L.L. Wallace. Land-use and landscape structure changes in the Wichita Mountains of Oklahoma. *Ecological Society of America.*

1997 Hoagland, B.W., **S.T. Gray**, and F.L. Johnson. Vegetation classification and mapping of a grassland-forest mosaic in south-central Oklahoma. *International Association of Vegetation Scientists.*

INVITED PRESENTATIONS:

Gray, S.T. **Impacts of climate variability and climate change on semi-arid vegetation.** *Eastern Nevada Landscape Coalition Annual Workshop, Ely, Nevada. June 16, 2006.*

Gray, S.T. **Long-term perspectives on climate variability and climate-change impacts: implications for wilderness management.** *USDA-Forest Service Region Four Integrated Resource Mangement Workshop, Ogden, Utah. March 30, 2006.*

Gray, S.T. **Fits and starts: nonlinear dynamics in plant migration.** *University of Washing, Climate Impacts Group, Seattle, Washington. November 8, 2005.*

Gray, S.T. **Drought in the Upper Colorado River Basin: lessons from thirty years of tree-ring Research.** *The Water Education Foundation, Colorado River Symposium, Santa Fe, New Mexico. September 28, 2005.*

Gray, S.T. **Long-term perspectives on extreme climatic events in the southwestern U.S.** *Sandia National Laboratories, Albuquerque, New Mexico. April 7, 2005.*

Gray, S.T. **Updated reconstructions of Colorado River flow.** *Department of the Interior, U.S.-Mexico Field Coordinating Committee Meeting, Tucson, Arizona. May 24, 2005.*

Gray, S.T. **Tree rings, oceans and drought: Long-term perspectives on western U.S. climate.** *Annual Bureau of Land Management Western Regional Leadership Meeting, Boise, Idaho. November 11, 2004.*

Gray, S.T. **Living with non-stationary climates in western North America.** *Laboratory of Tree-Ring Research, Tree-Ring Talks, University of Arizona.* October 26, 2004.

Gray, S.T. **The scientists' overview: Long-term climate variability and its implications for ecosystems and natural resource management on the Colorado Plateau.** *7th Biennial Conference of Research on the Colorado Plateau-Clients'Day, Northern Arizona University.* November 3, 2003.

Gray, S.T. **Long-term perspectives on climate variability in the Rocky Mountain West.** *Ecology Lecture Series, Montana State University.* October 16, 2003.

Gray, S.T. **Tree-ring based reconstructions of precipitation variability in the Bighorn Basin region over the past 750 years.** *Wyoming Water Development Commission, Wind/Bighorn Basin Advisory Group Meeting, Cody, Wyoming.* April 1, 2003.

Gray, S.T. **Tree-ring based reconstructions of precipitation variability in southwestern Wyoming over the past 750 years.** *Wyoming Water Development Commission, Green River Basin Advisory Group Meeting, Rock Springs, Wyoming.* March 25, 2003.

Gray, S.T. 2002. **Climate variability and tree-rings.** *Fall Research Series, Medicine Bow National Forest, Laramie, Wyoming.* October 19, 2002.

Gray, S.T. 2002. **Planning for droughts in the Central Rockies: lessons from the tree-ring record.** *Laboratory of Tree-Ring Research, Tree-Ring Talks, University of Arizona.* May 10, 2002.

Gray, S.T. 2002. **A paleo-history of droughts in western Wyoming.** *Governor's Drought Management Task Force, State of Wyoming.* March 19, 2002.

REPRESENTATIVE FUNDING:

2006 National Oceanic and Atmospheric Administration, Climate Change Detection and Data Program (Co-PI with T. Piechota and G. Tootle). "*Evaluation of Western U.S. Hydrologic Drought using Reconstructed Streamflow and Snowpack."* (In Review, Requesting $279,000).

2006 National Oceanic and Atmospheric Administration, Climate Change Detection and Data Program (Co-PI C. Woodhouse and others***).*** *"Interpreting and Refining the Climate Signal in Millennial-Length 5-Needle Pine Chronologies."* (In Review, Requesting $115,00).

2006 National Science Foundation, Geography and Regional Science Program (Co-investigator with L.G. Graumlich and others). "*A novel approach for improving records of long-term, multi-scale snowpack variability in western North America."* ($98,000).

2006 National Park Service. *"Linking the monitoring of climate and ecosystems in the Greater Yellowstone Region."* ($21,000).

2004-2006 National Research Council-Research Associate Program, U.S. Geological Survey Post-Doctoral Research Award. "*Assessing the Importance of Low-Frequency Climate Variability in Forecasting Ecological and Hydrologic Change Across the Rocky Mountain West."* ($157,000).

2004 National Park Service-Greater Yellowstone Network, Inventory and Monitoring Program. *"Development of climate-monitoring protocols for the Greater Yellowstone Network."* ($40,000).

2001-2003 U.S. Geological Survey-Wyoming Water Development Commission Water Research Program (Co-investigator with S.T. Jackson). *"Combining modern and paleo-techniques for improved drought prediction and response."* ($57,479)

2000 University of Wyoming-National Park Service Research Station (Co-investigator with S.T. Jackson). *"Tree-ring based reconstructions of climate variability in the eastern Yellowstone Region."* ($4,500)

PROFESSIONAL SERVICE:

Program committee for the 2006 Annual Meeting of The American Quaternary Association.
Co-organizer, Workshop on Climate Change and Wilderness Areas, World Wilderness Congress 2005.
Lead organizer, Workshop on Climate Change and Natural Resource Management, 2005 Mountain Climate Symposium-MTNCLIM.
Reviewer for *Journal of Climate, Quaternary Research, Global Change Biology, Journal of the American Water Resources Association, International Journal of Climatology, Canadian Journal of Water Resources, Southwest Naturalist,* and *Ecological Applications.*
Graduate Student Representative to the Faculty, Department of Botany, University of Wyoming (2001/2002).

PROFESSIONAL MEMBERSHIPS:

American Association of State Climatologists
American Geophysical Union
Association of American Geographers

Ann M. Lynch
VITAE

Research Entomologist
Rocky Mountain Research Station
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Tucson AZ 85721-0058

CAREER GOALS: Achievement of expert scientific knowledge of western forest insect disturbance ecology, development of quantitative tools to assist in the management of western forest insects, and effective transfer of technology to clients. I conduct research on the ecological roles of insects in forested ecosystems, with emphases on high elevation coniferous ecosystems of the North American Southwest, the effects of climate change on forest insect disturbance ecology, and the interaction of fire, insects, climate, and anthropogenic effects. The long term goal of this research is to provide information needed for resource management and decision support for forest health and productivity. I also conduct research on the ecology of *Elatobium abietinum*, an exotic aphid on *Picea* in North America. This research encompasses basic biology, ecology, and population dynamics of this insect as well as pest impact assessment and prediction in both Southwestern interior montane ecosystems and Pacific Northwestern coastal maritime ecosystems. The long term goal of this research is to minimize the impacts of this exotic to Southwestern forest health, productivity, and biodiversity.

EDUCATION:

Academic Education:

- Pennsylvania State University, B.S., 1977, Forest Science
- University of Michigan, 1981, M.S., Natural Resources (Entomology/Pest Management)
- University of Michigan, 1984, Master of Forestry, Biometrics
- University of Michigan, 1984, Ph.D., Natural Resources (Entomology/Pest Management)

Continued Education and Training, Technical:

ArcGIS 8.3, 32 hours, AllPoints GIS, Albuquerque NM, 2004

Hazardous Materials First Responder, 8 hours, A.D.E.M., Williams AZ, 2003
Microsoft Access Data Base Management, 16 hours, Northern Arizona University, 1999
Noxious Weeds, 16 hours, Coconino National Forest, Flagstaff AZ, 1998
Decision Support Systems, Forest Health Technology Enterprise Team, Fort Collins CO, 1997
Variable Plot Sampling, Oregon State University, Corvallis OR, 1997
Principles of Modeling, Fort Collins CO, 1996
Prescribed Fire for Resource Managers, Lakewood CO. Colorado State University and USDA Forest Service, 1995
Research Management Training, Washington D.C., 1994
Entomological Photography, Woodland Park CO, 1992
UNIX for Humans, Growth Group I, Inc., Fort Collins, CO, 1992
Fire Restoration in Rocky Mountain Ecosystems, National Wildfire Coordination Group, Colorado State University, Estes Park CO, 1992
GPS & GIS for Natural Resource Managers, Colorado State University, Fort Collins CO, 1992
Gengym and Stand Prognosis Workshop, USDA Forest Service, Washing Office Timber Management, Albuquerque NM, 1990
Microcomputer Skill Training, Texas A & M Univ., Fort Collins CO, 1989
Recent Developments in Forest Sampling and Modeling Short Course, Virginia Polytechnic Institute and State University, Blacksburg VA, 1988
Project Learning Tree, Oracle AZ, 1986

Continued Education and Training, Administrative:

Communication for Supervisors, 24 hours, Maurice Brown & Assoc., Fort Collins CO, 2001
Managing the Federal Employee, 16 hours, Northern Colorado Cooperating Agencies, 1999
Contracting Officer's Representative Certification, Laramie WY, 1997
Master Agreement between the National Federation of Federal Employees and the U.S. Forest Service, Fort Collins CO, 1990; Flagstaff AZ, 1996
Management Policy Seminar, Washington D.C., 1992
Leadership & Supervisory Skills for Women, National Seminars, 1991
The Role of Supervisors and Managers in EEO, United States Office of Personnel Management, Fort Collins CO, 1990
Management Seminar, General Management Training Inst., Golden CO, 1990
Supervisory Development, Inspiro, Denver CO, 1990
Time Management and Personal Effectiveness, Training in Management, Effectiveness Inc., Fort Collins CO, 1989

EXPERIENCE: Research Entomologist GS-14, Rocky Mountain Research Station, U.S. Forest Service, Flagstaff & Tucson AZ, since 2005

- 1989-2005: GS-13 Research Entomologist, Rocky Mountain Research Station, U.S. Forest Service, Fort Collins CO & Flagstaff AZ
- 1987-1989: GS-12 Research Entomologist, Rocky Mountain Research Station, U.S. Forest Service, Fort Collins CO
- 1985-1987: Assistant Professor of Watershed Management (Forest Resources Management), School of Renewable Natural Resources, University of Arizona

- 1980-1984: Research Assistant in Forest Entomology, School of Natural Resources, University of Michigan, Ann Arbor and Iron River MI
- 1978-1979: Regional Plans and Operations Forester, Oklahoma Region, Weyerhaeuser Company, Wright City OK
- 1978: Professional Intern/Scientist I (Entomology), Southern Forestry Research Center, Weyerhaeuser Company, Hot Springs AR
- 1977-1978: Professional Intern/Scientist I (Forest Regeneration), Western Forestry Research Center, Weyerhaeuser Company, Centralia WA

- 2006-present: Adjunct Associate Professor, The University of Arizona, Laboratory of Tree-Ring Research
- 1998-present: Adjunct Faculty, Northern Arizona University, School of Forestry, Flagstaff AZ

1989-present: Faculty Affiliate, Colorado State University, Department of Bioagricultural Sciences and Pest Management, Fort Collins CO

PROFESSIONAL RECOGNITION:

- Certificate of Merit for outstanding technology transfer, with cash award, USDA Forest Service, Rocky Mountain Research Station, 1998
- Certificate of Merit for continuous dedication to excellence in forestry education, with cash award, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, 1988
- Distinguished Alumni Award, Alumni Society of the School of Resources, University of Michigan, 1986
- Donald M. Matthews Award in Forest Management, with cash award, Faculty of the School of Natural Resources, University of Michigan, 1984
- Samuel A. Graham Award for Outstanding Scholarship in Forest Biology and Superior Writing Capability, with cash award, Faculty of the School of Natural Resources, University of Michigan, 1983
- Traveling Scholar, Committee on Institutional Cooperation, 1982
- Xi Sigma Pi, elected Member, 1976

CURRENT RESEARCH PROJECTS

- Cumulative effects of multiple insect outbreaks in Southwestern high elevation forests
- History of forest insect outbreaks in Southwestern forests ecosystems: what does the historical record show us?
- Growth and demography of Pinaleño high-elevation forests (mixed-conifer and spruce-fir)
- Investigations of the life history, biology, ecology, population dynamics, and impact of the exotic insect spruce aphid in Western ecosystems, including Southwestern high elevation and Pacific Northwestern maritime ecosystems
- Ecology of western spruce budworm in Southwestern mixed-conifer forests
- Develop decision support tools for quantifying and predicting insect populations and damage in Rocky Mountain and Southwestern ecosystems.
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ANTICIPATED OUTCOME OF CURRENT RESEARCH

- Better understanding of the disturbance ecology of forest insects in high-elevation Southwestern ecosystems with respect to spatial and temporal patterns and to interactions with climatic patterns.
- An understanding of the life cycle, impact, population dynamics, associated weather factors, and future risk of spruce aphid in Southwestern and Northwestern ecosystems.
- Continued development of quantitative & predictive tools regarding defoliation and leaf-feeding insects for use by resource mangers.

RECENT & MAJOR RESEARCH OUTPUTS

- Lynch AM. *In press.* Spruce aphid, *Elatobium abietinum* (Walker): Life history and damage to Engelmann spruce in the Pinaleño Mountains, Arizona. University of Arizona Press
- Koprowski JL, Alanen MI, Lynch AM. 2005. Nowhere to run and nowhere to hide: Response of endemic Mt. Graham red squirrel to catastrophic insect damage. Biological Conservation 126:491-498.
- Lynch A.M. 2004. Fate and characteristics of spruce defoliated by *Elatobium abietinum* in Arizona, U.S.A. Western North American Naturalist 64(1): 7-17.
- Ryerson D.E., Swetnam T.W., Lynch A.M. 2003. A tree-ring reconstruction of western spruce budworm outbreaks in the San Juan Mountains, Colorado, USA. Can. J. For. Res. 33: 1010-1028.
- Lynch A.M. 2003. Comparison of fixed-area plot designs for estimating stand characteristics and western spruce budworm damage in southwestern U.S.A. forests. Can. J. For. Res. 33(7): 1245-1255.
- Swetnam T.W., Lynch A.M. 1993. Multicentury, regional-scale patterns of western spruce budworm outbreaks. Ecol. Monogr. 63(4):399-424.
- Swetnam T.W., Lynch A.M. 1989. A tree-ring reconstruction of western spruce budworm history in the southern Rocky Mountains. Forest Sci. 35(4):962-986.
- Lynch A.M., Witter J.A. 1985. Relationships between balsam fir mortality caused by the spruce budworm and stand, site, and soil variables in Michigan's Upper Peninsula. Can. J. For. Res. 15:141-147.
  Lynch A.M. 1984. The pales weevil, Hylobius pales (Herbst): A synthesis of the literature. J. Georgia Entomol. Soc. 19(2), First Supple. 34 p. (still one of the most-requested paper's I've written).

MANUSCRIPTS IN PREPARATION

- Lynch A.M. Insects as agents of change in Sky Island ecosystems. USDA Forest Service, Rocky Mountain Research Station GTR
- Lynch A.M. and M.E. Schultz. Weather factors associated with spruce aphid outbreaks in southeast Alaska.
- Lynch A.M. and R.A. Fitzgibbon. Observations on the life history of *Nepytia janetae* in Arizona, *in press* with Southwestern Entomologist, and, Impact of *Nepytia janetae* (Lepidoptera: Geometridae) in spruce-fir forests in Arizona, U.S.A., for J. Econ. Entomol. Withdrawn, pending taxonomic clarification of the species.
- Lynch A.M. and J. Jenness. One hundred years of forest insect outbreaks in the Pinaleño Mountains.

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RECENT SCIENTIFIC PRESENTATIONS & TECHNOLOGY TRANSFER

- International Society of Arboriculture, Minneapolis MN. Invited speaker, "Insects as agents of change in warming western North American forests"
- 8th Biennial Conference of Research on the Colorado Plateau, November 2005, Flagstaff AZ. Invited speaker. "Global warming and insect outbreaks in Southwestern forests"
- MTNCLIM, Chico, Montana: Climate change in mountain ecosystems. February 2005. Poster. "Contemporary weather patterns in Southwestern forests: Potential effects on forest insect population dynamics".
- Biodiversity and Management of the Madrean Arichipelago Conference, May 2004, Tucson AZ, invited plenary speaker, "Insects as agents of change".
- USDA Forest Service Forest Health Monitoring Working Group meeting, February 2004, Sedona AZ, Invited plenary speaker, "Impacts to high elevation forests of the Southwest".
- 7th Biennial Conference of Research on the Colorado Plateau, Impacts of a Megadrought on Colorado Plateau Ecosystems session, invited speaker, "Southwestern climate trends and forest insects: small changes with amplified responses".
- Spruce Aphid Field Tour, co-organizer, October 2003, Safford AZ, a field trip for managers and researchers to view and discuss the exotic insect spruce aphid in Southwestern ecosystems, including population ecology, impact, ecosystem significance, and potential northerly spread, as well as an extended tour of infestations in multiple mountain ranges for international visitors.
- Ecological Society of America Annual Meeting, August 2003, Savannah GA, invited speaker in the "Severe Insect Outbreaks in North American Forests: Recent Trends, Longterm Recurrence, and the Role of Climate" Symposia, "Dendrochronologic evidence of the role of climate affecting insect outbreaks".

KEY SPECIAL ASSIGNMENTS

- Coronado N.F., Interdisciplinary Team for Pinaleño Ecosystem Restoration Project, 2004-?
- Coronado N.F. Forest Plan Revision, analysis report of the history of insect outbreaks on the Forest (with subsequent request for the rest of Region 3)
- Flagstaff Lab: Safety Committee (2002-2005).
- Rocky Mountain Forest & Range Experiment Station Library Advisory Committee & Internal Communications Committee (1996-2000)
- Arapaho-Roosevelt N.F. Forest Plan Interdisciplinary Team, 1995-1996.