

## CURRICULUM VITAE

**Lisa J. Graumlich**

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### Education

Ph.D., College of Forest Resources, University of Washington, 1985  
M.S., Department of Geography, University of Wisconsin-Madison, 1978  
B.S., Department of Botany, University of Wisconsin-Madison, 1975

### Current Position

Professor and Director, School of Natural Resources and the Environment, The University of Arizona 2007 - present

### Past Positions

Executive Director, Big Sky Institute for Science and Natural History, Montana State University, 2001 to 2006  
Director, Mountain Research Center, Montana State University, June 1999 to 2001  
Adjunct Associate Professor, Earth and Environmental Sciences, Columbia University, 1998 to 2000  
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)  
Director, Institute for the Study of Planet Earth, University of Arizona, 1993 to 1997  
Associate Professor, Laboratory of Tree-Ring Research, University of Arizona, 1993 to 1999  
Assistant Professor, Laboratory of Tree-Ring Research, University of Arizona, 1988 to 1993  
Assistant Professor, Department of Geography, UCLA, 1986-1988  
Post-Doctoral Research Associate, Department of Ecology, Evolution and Behavior, University of Minnesota, 1986

### Awards and Special Appointments

Fellow, American Association for the Advancement of Science, 2004  
Fellow, Aldo Leopold Leadership Program, 1999  
Fellowship, Udall Center for Studies in Public Policy, University of Arizona 1996-97  
Distinguished Researcher in Residence, Mountain Research Center, Montana State University, 1997  
W.J. Cooper Award, Ecological Society of America, 1998 (for outstanding paper)

### Selected Leadership/Memberships in Professional Organizations

Co-leader, Integrated history and future of people on Earth (IHOPE): Building a community data base and testing the resilience - sustainability hypothesis across scales, National Center for Ecological Analysis and Synthesis Working Group, 2008-2010  
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*, 1989-2003
- Ecological Society of America (Governing Board: Secretary 1998-2000; Member-at-Large, 2010-2012)
- American Geophysical Union
- American Association for the Advancement of Science

## Selected Publications

### *Peer-reviewed journal articles*

- Pederson, GT, LJ **Graumlich**, DB Fagre, TF Kipfer, and CC Muhlfeld. 2010. A century of climate and ecosystem change in Western Montana: what do temperature trends portend? *Climate Change* 98:133-154.
- Schrag, A.M., A. G. Bunn, and **L.J. Graumlich**. 2008. Influence of bioclimatic variables on tree-line conifer distribution in the Greater Yellowstone Ecosystem: implications for species of conservation concern. *Journal of Biogeography* 35 (4): 698-710
- Costanza R, **Graumlich L**, Steffen W, Crumley C, Dearing J, et al. 2007. Sustainability or Collapse: What Can We Learn from Integrating the History of Humans and the Rest of Nature? *AMBIO: A Journal of the Human Environment*: Vol. 36, No. 7 pp. 522–527
- Gray, ST, **Graumlich, LJ**, Betancourt, JL. 2007. Annual precipitation in the Yellowstone National Park region since AD 1173. *Quaternary Research*, 68 (1): 18-27.
- 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
- Brown, K., A.J. Hansen, R.E. Keane, and L.J. **Graumlich**. 2006. Complex interactions shaping aspen dynamics in the Greater Yellowstone Ecosystem. *Landscape Ecology* 21 (6): 933-951.
- Sankey, TT, Montagne, C, **Graumlich, LJ**, Lawrence, R. and Nielsen, J. 2006. Twentieth century forest-grassland ecotone shift in Montana under differing livestock grazing pressure. *Forest Ecology and Management*, 234 (1-3): 282-292.
- Sankey, TT, Montagne, **Graumlich, LJ**, Lawrence, R, Nielsen, J. 2006. Lower forest-grassland ecotones and 20th Century livestock herbivory effects in northern Mongolia. *Forest Ecology And Management*, 233 (1): 36-44.
- Bunn, AG; Waggoner, LA; **Graumlich, LJ**. 2005. Topographic mediation of growth in high elevation foxtail pine (*Pinus balfouriana* Grev. et Balf.) forests in the Sierra Nevada, USA. *Global Ecology and Biogeography*, 14 (2): 103-114/
- Graumlich, LJ**; Sugita, S; Brubaker, LB; Card, VM. 2005. Paleoperspectives in ecology. *Ecology*, 86 (7): 1667-1668.
- 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.
- 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.
- 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.
- Diaz, HF, M. Grosjean, and L.J. **Graumlich**. 2003. Climatic variability and change in high elevation regions: Past, present and future. *Climatic Change* 59, 1-4.
- 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
- 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.
- Dickinson, Robert E., Shaikh, Muhammad, Bryant, Ross, **Graumlich**, Lisa. 1998. Interactive Canopies for a Climate Model. *Journal of Climate* 11: 2823-2836
- 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.
- 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.
- 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.
- Graumlich**, L.J. 1994. High resolution pollen analysis provides new perspective on catastrophic elm decline. *Trends in Ecology and Evolution* 8, 387-388.
- 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. 1991. Subalpine tree growth, climate, and increasing CO<sub>2</sub>: an assessment of recent growth trends. *Ecology* 72: 1-11.
- 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. 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 discriminant analysis. *Canadian Journal of Botany* 65, 899-906.
- 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. and L.B. Brubaker. 1986. Reconstruction of annual temperature (1590-1979) for Longmire Washington derived from tree rings. *Quaternary Research* 25, 223-234.

*Peer-reviewed books and book chapters*

- Costanza, R., **Graumlich, L.**, and W. Steffan (eds.). 2007. *Sustainability or Collapse: Integrated history and future of people on earth*. Boston, MIT Press.
- 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. 2007. 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.
- Graumlich**, L.J., L.A. Waggoner and A.G. Bunn. 2005. Detecting Global Change at Alpine Treeline: Coupling Paleocology with Contemporary Studies. In *Global Change and Mountain Regions: A State of Knowledge Overview* (Huber and Buggman, eds., Kluwer.), pp. 501-508.
- 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. 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.
- 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 L.B. Brubaker. 1995. Long-term records of growth and distribution of conifers: Integration of Paleocology and Physiological Ecology. In *Ecophysiology of Coniferous Forests*, W.K. Smith and T.M. Hinckley, eds., Academic Press, New York, pp. 37-62.
- Graumlich**, L.J. 1994. Long-term vegetation change in mountain environments: Paleocological insights into modern vegetation dynamics. In *Mountain Environments in Changing Climates*, M. Beniston, ed., Routledge, London, pp. 167-179.

**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 citizen groups and NGOs (e.g., National Audubon Society, The Nature Conservancy, Greater Yellowstone Coalition) and informal science education institutions (e.g., Museum of the Rockies, Bozeman; Arizona Sonoran Desert Museum, Tucson; Yellowstone National Park, Glacier National Park, Saguaro National Park). Finally, I seek opportunities to address current science issues through the national media in venues such as Science Friday ([http://www.sciencefriday.com/pages/2007/Apr/hour2\\_042007.html](http://www.sciencefriday.com/pages/2007/Apr/hour2_042007.html)) and the NewsHour with Jim Lehrer ([http://www.pbs.org/newshour/bb/weather/july-dec07/fire\\_07-09.html](http://www.pbs.org/newshour/bb/weather/july-dec07/fire_07-09.html)).

**Grants And Contracts*****Grants awarded while at The University of Arizona (2007- present)***

- National Science Foundation, Climate-Induced Shifts in Alpine Diatom Communities: Past Mechanisms and Future Predictions under Enhanced Nitrogen Deposition, \$533,179, 3/1/07 – 2/28/10 (Graumlich is co-I)
- DoE NICCR, Climatic and biotic co-limitation of conifer establishment at treelines: addressing uncertainty in bioclimatic model forecasts of forest change, \$461,585, 7/07-6/10 (Graumlich is co-I)
- US Forest Service, Research and Tools to Assess Risk From Climate Change, \$182,494, 8/08-01/12

***Grants awarded while at Montana State University (1999-2006)******MSU Research***

- 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/Graumlich subcontract \$501,463)

National Science Foundation, A novel approach for improving records of long-term, multi-scale snowpack variability in Western North America, 2006-2007, \$97,000

US Geological Survey, Linking Long Term Local and Regional Records of Climate Variability, 2004-2005, \$62,000

***MSU-Big Sky Institute 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

National Science Foundation, 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 (PI G. Wheeler, 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

NOAA, Mountain Climate Workshop, 2006-2007, \$10,000

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, 7<sup>th</sup> Biennial Conference on Greater Yellowstone Ecosystem, 2003-2005, \$13,075

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

National Science Foundation, 2007-2010, IRES: U.S.-Norway: Globalizing Perspectives on Climate Change and Ecosystem Health--Opportunities for Undergraduate Participation in Science and Policy, \$165,852; Graumlich was co-I and resigned to move to UA

National Science Foundation, 2006-2010, ADVANCE Leadership Award: Big Sky Leadership Initiative to Advance Women Into Careers in Research Leadership; PI Capalbo; \$299,222; Graumlich was co-I and resigned to move to UA

**Grants awarded while at The University of Arizona (1988-1999)**

- 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)

**Thesis Advisor and Postgraduate–Scholar Sponsor (including current position)**

*Undergraduate research:* Lindsey Waggoner (Big Sky Carbon Sequestration Partnership, Montana State University); Gabe Bellante (US Forest Service); Andra Toivola (Wildlife Conservation Society); Tim Sharac (EPA); Sean Hill (Teach for America); Chris Caruso (Peace Corps Fellow, School of Public Health, University of Arizona); Jasmine MacBeath (teacher, Manaus, Amazona), Steven Miller (current, journalism student)

*Graduate students:* MaryBeth Keifer (Sequoia National Park); Ginger Burley (Yosemite National Park); Andrea Lloyd (Middlebury College); Paul Sheppard (University of Arizona); Amy Hessel (University of West Virginia); Jeremy Littell (University of Washington); Andy Bunn (Western Washington University); Greg Pederson (USGS); Temuulen Tsagaan Sankey (University of Idaho)

*Postgraduate Scholar:* Michael Pisarcic (Carleton University); Stephen Gray (Wyoming State Climatologist, University of Wyoming)