

MICHAEL J. HAYES

PERSONAL

Work Address: National Drought Mitigation Center (NDMC)
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EDUCATION

Ph.D.	1994	University of Missouri-Columbia	Atmospheric Science
M.S.	1989	University of Missouri-Columbia	Atmospheric Science
B.S.	1986	University of Wisconsin-Madison	Meteorology

PRESENT POSITION

8/2007-present, *Associate Professor/Director*, National Drought Mitigation Center, Lincoln, NE
Current appointment: 30% NDMC Director, 35% service/outreach, 23% research, 10% teaching, and 2% university service. Administer the research and outreach programs of the NDMC; conduct research on the impacts of drought and assist with post-drought evaluations; develop new monitoring and impact assessment methodologies; analyze current drought plans and assist local, state, tribal, and federal officials, as well as the private sector, with drought preparedness and drought mitigation issues; and assist in the organization and conduct of workshops and conferences, as well as the preparation of technical and non-technical reports.

EXPERIENCE AND TRAINING

4/2006-7/2007, *Associate Professor/Associate Director*, National Drought Mitigation Center, Lincoln, NE

Appointment: 58% research, 40% service/outreach, and 2% university service.
Researched new drought monitoring, impact assessment, and planning methodologies; assisted local, state, tribal, and federal officials with drought planning and mitigation; helped organize and conduct drought workshops and conferences; and prepared technical and non-technical reports.

7/2003-3/2006, *Associate Professor/Climate Impacts Specialist*, National Drought Mitigation Center, Lincoln, NE

See position description above.

7/1995-6/2003, *Assistant Professor/Climate Impacts Specialist*, National Drought Mitigation Center, Lincoln, NE

See position description above.

2/1995-7/1995, *Physical Scientist*, AScI Corporation, Columbia, Missouri

Worked with the National Biological Service in support of the Long-Term Ecological Monitoring Program within the National Park Service. Responsible for developing the protocols for monitoring the weather conditions that impact the populations of two endangered prairie plant species; completed annotated bibliographies discussing studies documenting the impact of different weather variables on the plant populations; and selected and purchased automated weather stations for two sites; one in southwest Missouri and one in southwest Minnesota.

1987-1994, *Graduate Research Assistant*, Department of Atmospheric Science, University of Missouri-Columbia

Responsible for thesis and dissertation research, and interacted with the Food and Agricultural Policy Research Institute (FAPRI) and the NOAA Climate Applications Branch, both located in Columbia, Missouri. Guest lectured in several courses.

RESEARCH INTERESTS

Drought mitigation strategies and technology; drought impacts, vulnerability assessment, and risk analysis; economic impacts of drought and other natural hazards; water and hydrological issues; precipitation indices, and remote sensing applications.

PROFESSIONAL MEMBERSHIPS

American Meteorological Society

American Geophysical Union

Center for Great Plains Studies (Fellow)

CURRENT GRANTS

Drought Mitigation, Nebraska. M. Hayes (PI), M. Svoboda, C. Knutson, and B. Wardlow. USDA-CSREES. \$437,243. 8/1/2009 to 7/31/2010.

Development of a Pilot Drought Information System for National Drought Disaster Reduction. J. Ryu and M. Hayes (Co-PI). Kongju National University in Korea. \$70,000. 10/1/2008 to 9/30/2011.

Low Flow Project in the Alabama, Coosa, and Tallapoosa (ACT) River Basins, and the Appalachian, Chattahoochee, and Flint (ACF) River Basins. M. Hayes (Co-PI), M. Svoboda, C. Knutson, D. Woudenberg, M. Widhalm. NWS Southern Region Headquarters. \$24,999. 9/15/2008 to 9/14/2010.

Drought Mitigation, Nebraska. M. Hayes (PI), M. Svoboda, C. Knutson, and B. Wardlow. USDA-CSREES. \$347,246. 7/15/2008 to 7/14/2010.

Hawaii Drought Plan. M. Hayes (Co-PI), M. Svoboda, Y. Ding, K. Smith, S. Scott, and M. Widhalm. Commission on Water Resource Management, State of Hawaii. \$100,000. 6/23/2008 to 6/30/2010.

An Assessment of Decadal Drought Information Needs of Stakeholders and Policymakers in the Missouri River Basin for Decision Support. V. Mehta, N. Rosenberg, M. J. Hayes (Co-PI), C. L. Knutson and J. R. Olsen. NOAA. \$294,111. 5/1/2008 to 4/30/2010.

Transitioning the Drought Impact Reporter into an Operational System. PI: M. Hayes. Co-PIs: D. Wilhite, M. Svoboda, G. Garfin, C. Knutson, D. Wood, and M. Higgins. NOAA's Transition of Research Applications to Climate Services Program. \$453,523. 8/1/2007 to 7/31/2010.

Estimating the Impacts of Complex Climatic Events: the Economic Costs of Drought in Colorado, Nebraska, and New Mexico. Co-PIs: D. Wilhite, R. Pulwarty, M. Hayes, R. Supalla, and C. Howe. NOAA Climate Program Office. \$328,971. 8/1/2006 to 7/31/2010.

Rangeland and Forage Geospatial Decision Support System for Drought Risk Management. Co-PIs: D.A. Wilhite, K. Hubbard, M. Svoboda, T. Tadesse, J. Brown, M. Hayes, C. Knutson, J. Volesky, and M. Tooze. USDA/RMA. \$1,023,038. 10/1/2005 to 9/30/2010.

Drought Risk, Impact, and Mitigation Information System. Co-PIs: S. Goddard and D. Wilhite. Collaborators: M. Hayes, M. Svoboda, T. Tadesse, C. Knutson, K. Schoengold, and K. Hubbard. USDA/RMA. \$6,407,472. 10/1/2005 to 9/30/2010.

RECENT GRANTS

Developing a Drought Preparedness Framework for Tribal Governments: Moving From Crisis to Risk-Based Management. M. J. Hayes (PI), C. L. Knutson and M. D. Svoboda. United States Bureau of Indian Affairs. \$160,000. 10/19/2007 to 10/18/2008.

An Assessment of the Hydrologic Vulnerability of the Missouri River Basin to Climate Variability at Interannual to Decadal Timescales. PIs: V. Mehta and N. Rosenberg. Collaborators: M. Hayes and C. Knutson. Advisor: D. Wilhite. NOAA-OGP. \$300,000. 10/1/2005 – 9/30/2008.

Climate and Soil Risk Information System. Co-PIs: S. Goddard and D. Wilhite. Collaborators: M. Hayes, M. Svoboda, and C. Knutson. USDA/RMA. \$1,212,055. 6/1/2005 to 5/31/2008.

Engaging Agricultural Communities in the Great Plains of the U.S. with the Application and Development of Climate Prediction and Information. PI: Steven Hu. Co-PIs: Gary Lynne, William Waltman, D.A. Wilhite, K.G. Hubbard, M.J. Hayes. NOAA Office of Global Programs, \$432,916. 5/1/02 to 7/31/06.

Sustainable Adaptation to Drought and Climate Variability in Agricultural Production Systems Across Nebraska. Co-PIs: M. Hayes, C. Knutson, R. Hitchcock, W. Waltman, J. Peake, and M. Kleinschmit. NOAA Office of Global Programs. \$107,909. 7/1/04 to 6/30/06.

Mitigating the Economic Risk of Stock Reduction During Drought: an Adoption Support Tool for Cattle Producers. Co-PIs: T. Buman and R. Buman. Collaborators: J. Ridgely, S. Buman, P. Mitchell, J. Hatfield, C. Knutson, and M. Hayes. USDA/RMA, \$576,136. 9/1/03 to 8/30/06.

National Drought Impacts Tool. Co-PIs: D.A. Wilhite and M.J. Hayes. Office of Global Programs/NOAA. \$24,380. 10/1/04 to 9/30/05.

Risk Assessment and Exposure Analysis on the Agricultural Landscape: A Holistic Approach to Spatio-Temporal Models and Tools for Agricultural Risk Assessment and Exposure Analysis. PIs: S. Goddard, D.A. Wilhite, J. Deogun, M. Hayes, K. Hubbard, H. Jose, S. Reichenbach, W. Waltman, and M. Svoboda. USDA Risk Management Agency, \$1,086,623. 10/1/02 to 3/31/05.

Improving Drought Monitoring through the Integration of Climate and Satellite-Based Data. Co-PIs: D.A. Wilhite, K.G. Hubbard, and M.J. Hayes. USGS, \$241,000. 7/1/02 to 6/30/05.

Improved Hydrologic Data Collection Systems for Drought Monitoring. Co-PIs: D.A. Wilhite, K.G. Hubbard, M.J. Hayes, and M.D. Svoboda. Nebraska Dept. of Natural Resources/Bureau of Reclamation. \$25,000. 2005.

Drought Risks and Mitigation on the Agricultural Landscape: A Series of Risk Analysis, Management, and Mitigation Workshops for Nebraska Farmers and Ranchers. PI: D.A. Wilhite. Co-PIs: M.J. Hayes, H.D. Jose, W.J. Waltman, K.G. Hubbard, Q.S. Hu, and M.D. Svoboda. USDA Risk Management Agency, \$95,198. 10/1/02 to 9/30/04.

Digital Government: A Decision Support System for Drought Risk Management. Co-PIs: S. Reichenbach, S. Goddard, W. Waltman, J. Deogun, D. Wilhite, P. Revesz, K. Hubbard, and M. Hayes. National Science Foundation, \$1,103,643. 5/1/01 to 4/30/04.

RECENT PUBLICATIONS (2001-Current)

Journal Articles

Fontaine, M. M., A. C. Steinemann, and M. J. Hayes. 2009. State drought programs: lessons and recommendations from the western U.S. *Natural Hazards Review*. (Accepted)

Wardlow, B., M. Hayes, M. Svoboda, T. Tadesse, and K. Smith. 2009. Sharpening the focus on drought: new monitoring and assessment tools at the National Drought Mitigation Center. *Earthzine*, unpaginated, <http://www.earthzine.org/2009/03/30/sharpening-the-focus-on-drought-%e2%80%93-new-monitoring-and-assessment-tools-at-the-national-drought-mitigation-center/>.

Brown, J. F., B. D. Wardlow, T. Tadesse, M. J. Hayes, and B. C. Reed. 2008. The Vegetation Drought Response Index (VegDRI): A new integrated approach for monitoring drought stress in vegetation. *GIScience and Remote Sensing* 45 (1):16-46.

Dubrovsky, M., M. D. Svoboda, M. Trnka, M. J. Hayes, D. A. Wilhite, Z. Zalud, and P. Hlavinka. 2008. Application of relative drought indices in assessing climate change impacts on drought conditions in Czechia. *Theoretical and Applied Climatology* 96 (1-2): 155-171. DOI: 10.1007/s00704-008-0020-x.

Trnka, M., M. Dubrovsky, M. D. Svoboda, D. Semerádová, M. J. Hayes, Z. Zalud, and D. A. Wilhite. 2008. Developing a regional drought climatology for the Czech Republic. *International Journal of Climatology*. 29: 863-883. DOI: 10.1002/joc.1745.

Wilhelmi, O. V., M. J. Hayes, and D. S. K. Thomas, 2008. Managing drought in mountain resort communities: Colorado's experiences. *Disaster Prevention and Management*. 15(5):672-680.

Woudenberg, D. L., D. A. Wilhite, and M. J. Hayes. 2008. Perception of drought hazard and its sociological impacts in South-Central Nebraska. *Great Plains Research*, 18(1): 93-102.

Knutson, C. L., M. J. Hayes, and M. D. Svoboda. 2007. Case study of tribal drought planning: the Hualapai Tribe. *Natural Hazards Review*, 8(4): 125-131.

Wilhite, D. A., M. D. Svoboda, and M. J. Hayes. 2007. Understanding the complex impacts of drought: a key to enhancing drought mitigation and preparedness. *Journal of Water Resources Management*, 21(5): 763-774.

Wu, H., M. D. Svoboda, M. J. Hayes, D. A. Wilhite, and F. Wen. 2007. Appropriate application of the Standardized Precipitation Index in arid locations and dry seasons. *International Journal of Climatology*, 27: 65-79.

Artikov, I., S. J. Hoffman, G. D. Lynne, L. M. PytlikZillig, Q. Hu, A. J. Tomkins, K. G. Hubbard, M. J. Hayes, and W. J. Waltman. 2006. Understanding the influence of climate forecasts on farmer decisions as planned behavior. *Journal of Applied Meteorology and Climatology*, 45(9): 1202-1214.

Hu, Q., L. M. Pytlik Zillig, G. D. Lynne, A. J. Tomkins, W. J. Waltman, M. J. Hayes, K. G. Hubbard, I. Artikov, S. J. Hoffman, and D. A. Wilhite. 2006. Understanding farmers' forecast use from their beliefs, values, social norms, and perceived obstacles. *Journal of Applied Meteorology and Climatology*, 45(9): 1190-1201.

Cooter, E., B. Eder, C. Rosenzweig, B. Lynn, R. Goldberg, C. Knutson, M. Hayes, D. Wilhite, J. DeCarolis, and T. Barnett. 2005. Effects of climate change on weather and water. *Environmental Management*, October: 32-35.

Tadesse, T., J. Brown, and M. Hayes. 2005. A new approach for predicting drought-related vegetation stress: integrating satellite, climate, and biophysical data over the U.S. central plains. *ISPRS Journal of Photogrammetry and Remote Sensing*, 59(4): 244-253.

Tadesse, T., D. Wilhite, M. Hayes, S. Harms, and S. Goddard. 2005. Discovering associations between climatic and oceanic parameters to monitor drought in Nebraska using data-mining techniques. *Journal of Climate*, 18(10): 1541-1550.

Wu, H., M. Hayes, D. Wilhite, and M. Svoboda. 2005. The effect of the length of record on the Standardized Precipitation Index calculation. *International Journal of Climatology*, 25: 505-520.

Hayes M., O. Wilhelmi, and C. Knutson. 2004. Reducing drought risk: bridging theory and practice. *Natural Hazards Review*, 5(2): 106-113.

Tadesse, T., D.A. Wilhite, S.K. Harms, M.J. Hayes, and S. Goddard. 2004. Drought monitoring using data mining techniques: A case study for Nebraska, U.S.A. *Natural Hazards*, 33(1):137-159.

Wells, N., S. Goddard, and M. Hayes. 2004. A self-calibrating Palmer Drought Severity Index. *Journal of Climate*, 17(12): 2335-2351.

Hayes, M., 2002. How drought impacts U. S. industry. *U. S. Industry Today*, 5(6): 16-17.

Peters, A. J., E. A. Walter-Shea, L. Ji, A. Viña, M. Hayes, and M. D. Svoboda. 2002. Drought monitoring with NDVI-Based Standardized Vegetation Index. *Photogrammetric Engineering and Remote Sensing*, 68(1): 71-76.

Seiler, R. A., M. Hayes, and L. Bressan, 2002. Using the Standardized Precipitation Index for flood risk monitoring. *International Journal of Climatology*, 22: 1365-1376.

Svoboda, M., M. Hayes, and D. Wilhite, 2002. The role of integrated drought monitoring in drought mitigation planning. *Annals of Arid Zone*, 40(1):1-11.

Svoboda, M., D. LeCompte, M. Hayes, R. Heim, K. Gleason, J. Angel, B. Rippey, R. Tinker, M. Palecki, D. Stooksbury, D. Miskus, and S. Stevens, 2002. An introduction to the Drought Monitor. *The Bulletin of the American Meteorological Society*, 83(8): 1181-1190.

Wu, H., M. Hayes, A. Weiss, and Q. Hu, 2001. An evaluation of the Standardized Precipitation Index, China-Z Index, and statistical Z-Score. *International Journal of Climatology*, 21: 745-758.

Chapters in Books and Technical Reports

Tadesse, T., B. D. Wardlow, and M. J. Hayes. 2009. The application of data mining for drought monitoring and prediction. pp. 280-291. In H. Rahman (ed.) *Data Mining Applications for Empowering Knowledge Societies*. Information Science Reference (IGI Global), Hershey, PA.

Hayes, M. and M. Svoboda. 2008. An assessment of drought management activities in Morocco prepared for USAID's Integrated Agriculture and Agribusiness Project. Office of Economic Growth, USAID Morocco.

Hayes, M., C. Alvord, and J. Lowrey. 2007. Drought indices. Intermountain West Climate Summary, 3(6): 2-6.

Hayes, M. and M. Svoboda. 2007. An assessment of drought management activities in Morocco prepared for USAID's Integrated Agriculture and Agribusiness Project. Office of Economic Growth, USAID Morocco.

Rosenberg, N., V. Mehta, M. Hayes, C. Knutson, and M. Sittler. 2007. Decadal climate information needs of stakeholders and policymakers in the Missouri River Basin: a report of the elicitation trip to Nebraska, 11-14 December 2006. NOAA Climate Program Office, Sectoral Applications Research Program.

Rosenberg, N., V. Mehta, R. Olsen, H. Von Storch, M. Hayes, and D. Wilhite. 2007. Societal adaptation to decadal climate variation in the U.S. *Eos* 88(43): October 2007.

Tadesse, T., B. Wardlow, and M. Hayes. 2007. The application of data mining for drought monitoring and prediction. In: *Data Mining Applications for Empowering Knowledge Societies*, H. Rahman, ed., Idea Group, Inc., Hershey, PA.

Knutson, C.L., M.J. Hayes, R. K. Hitchcock, J. Peake, and M. Kleinschmit. 2006. Sustainable adaptations to drought and climate variability in agricultural production systems across Nebraska: Final Report to NOAA's Human Dimensions of Global Change Research (HDGCR) Program. Grant Number NA040AR4310080.

Knutson, C.L., M.D. Svoboda, and M.J. Hayes. 2006. Analyzing Tribal Drought Management: A Case Study of the Hualapai Tribe. Quick Response Report #183, Natural Hazards Research and Applications Information Center, University of Colorado, Boulder
[<http://www.colorado.edu/hazards/research/qr/qr183/qr183.html>].

Tadesse, T., D.A. Wilhite, M.J. Hayes, J.F. Brown, and C.L. Knutson. 2006. Modern drought monitoring tool for decision support system. In: A. Anttiroiko and M. Malkia (eds.) *Encyclopedia of Digital Government*, Volume 3. pp. 1212 – 1218. Idea Group Reference. Hershey, PA.

Thomas D., O.V. Wilhelmi, and M.J. Hayes. 2006. Disaster reduction, drought, and the mountain resort community. In: T. Clark, A. Gill, and R. Hartmann (eds.) *Mountain Resort Planning and Development in an Era of Globalization*. pp.221-233. Cognizant Communication Corporation. New York.

Hayes, M. J., C. L. Knutson, and Q. Hu. 2005. Multiple-year droughts in Nebraska. *NebGuide*. University of Nebraska Cooperative Extension Service.

Hayes, M., M. Svoboda, D. LeComte, K. Redmond, and P. Pasteris. 2005. Drought Monitoring: New Tools for the 21st Century. In: *Drought and Water Crises: Science, Technology, and Management Issues*, D. Wilhite, ed., CRC Press.

Knutson, C., M. Hayes, and T. Tadesse, 2005. Stakeholder Group Discussions for Evaluation of the USGS Drought Monitoring Website and VegDRI Mapping Tool. NDMC Report to the USGS/EROS Data Center, Sioux Falls, SD.

Steinemann, A., M. Hayes, and L. Cavalcanti. 2005. Drought Indicators and Triggers. In: *Drought and Water Crises: Science, Technology, and Management Issues*, D. Wilhite, ed., CRC Press.

Wilhelmi, O.V., D. S. K. Thomas, and M. J. Hayes. 2005. Colorado Resort Communities and the 2002-2003 Drought: Impacts and Lessons Learned. Quick Response Report #174, Natural Hazards Research and Applications Information Center, University of Colorado, Boulder
[<http://www.colorado.edu/hazards/research/qr/qr174/qr174.html>].

Wilhite, D. A., M. J. Hayes, and C. Knutson. 2005. Drought Preparedness Planning: Building

Institutional Capacity. In: *Drought and Water Crises: Science, Technology, and Management Issues*, D. Wilhite, ed., CRC Press.

Wilhite, D. A., M. D. Svoboda, and M. J. Hayes. 2005. Monitoring Drought in the United States: Status and Trends. In: *Monitoring and Predicting Agricultural Drought: A Global Study*, V. J. Boken, A. P. Cracknell, and R. L. Heathcote, eds., Oxford University Press.

Hayes, M. and D. Wilhite, 2003. Drought Management. In: *Encyclopedia of Water Science*, B.A. Stewart and T.A. Howell, eds., Marcel Dekker, Inc., New York, pp. 170-172. (Invited, peer-reviewed).

Knutson, C. and M. Hayes, 2001. South Carolina drought mitigation and response assessment: 1998-2000 drought. Quick Response Report #136, Natural Hazards Research and Applications Information Center, University of Colorado, Boulder
[<http://www.colorado.edu/UCB/Research/IBS/hazards/qr/qr136/qr136.html>].

Conference Proceedings

Dubrovsky, M., M. Hayes, M. Svoboda, M. Trnka, D. Wilhite, and Z. Zalud. 2008. Future global drought conditions in terms of the Palmer Drought Indices. European Geophysical Union Annual Meetings, Vienna, Austria, April.

Dubrovsky, M., M. Trnka, M. Hayes, M. Svoboda, D. Semeradova, L. Metelka, and P. Hlavinka, 2008. Performance of an interpolated stochastic weather generator in Czechia and Nebraska. American Geophysical Union Annual Meetings, San Francisco, CA, December.

Svoboda, M., K. Smith, M. Sittler, S. Scott, J. Li, M. Hayes, D. Wood, D. Gutzmer, and M. Melvin, 2008. Drought impact reporting in the United States: giving the Drought Impact Reporter a face lift. *American Meteorological Society. Proceedings of the 17th Conference on Applied Climatology*, Whistler, British Columbia, Canada, August.

Trnka, M., M. Svoboda, M. Hayes, P. Hlavinka, M. Dubrovsky, D. Semeradova, and E. Hunt, 2008. Projections of soil climate during the 21st Century over the United States High Plains region with a focus on Nebraska. American Geophysical Union Annual Meetings, San Francisco, CA, December.

Dubrovsky, M., M. Svoboda, M. Trnka, M. Hayes, D. Wilhite, and Z. Zalud. 2007. Multi-GCM projections of global drought conditions with the use of the Palmer Drought Indices. American Geophysical Union Annual Meetings, San Francisco, CA, December.

Hayes, M., M. Trnka, M. Svoboda, P. Hlavinka, J. Balek, M. Dubrovsky, D. Wilhite, E. Pokorny, L. Bartosova, and J. Eitzinger. 2007. Understanding regional climate change consequences through the changes in soil moisture regimes. American Geophysical Union Annual Meetings, San Francisco, CA, December.

Trnka, M., M. Dubrovsky, D. Semeradova, Z. Zalud, M. Svoboda, M. Hayes, and D. Wilhite, 2006. Assessment of regional drought climatology: the Czech Republic as a case study. Proceedings of the European Geophysical Union. Vienna, Austria, April 1.

Brown, J., T. Tadesse, and M. Hayes, 2005. The Role of Remote Sensing in Improving Drought Decision Support. Proceedings of the Pecora Conference, Sioux Falls, SD, October 25.

Hayes, M., M. Dubrovsky, M. Trnka, M. Svoboda, D. Wilhite, Z. Zalud, and D. Semeradova, 2005. Application of Drought Indices for the Changed Climate. Proceedings of the American Geophysical Union, San Francisco, CA, December 7.

Hayes, M. M. Svoboda, M. Higgins, D. Wilhite, and D. Wood, 2005. The Drought Impact Reporter: A Web-based Drought Impacts Reporting Tool. Proceedings of the American Geophysical Union, San Francisco, CA, December 7.

Dubrovsky, M., M. Trnka, M. Svoboda, M. Hayes, D. Wilhite, Z. Zalud, and D. Semeradova, 2005. Drought Conditions in the Czech Republic in Present and Changed Climate. Proceedings of the European Geophysical Union, Vienna, Austria, June 15.

Dubrovsky, M., M. Trnka, M. Svoboda, M. Hayes, D. Wilhite, Z. Zalud, and D. Semeradova, 2005. Application of Three Drought Indices to Assess Impact of Climate Change on Drought Conditions. Proceedings of the European Meteorological Society, Utrecht, Netherlands, September 15.

Svoboda, M. and M. Hayes, 2005. A Web-based National Drought Impacts Reporting Tool. Proceedings of the 15th Conference on Applied Climatology, Savannah, GA, June 14.

Trnka, M., Z. Zalud, D. Semeradova, M. Dubrovsky, M. Svoboda, M. Hayes, D. Wilhite, and M. Mozny, 2005. Drought Occurrence Under Present and Future Climate. Proceedings of the Water and Plants: Challenges for Improved Production Conference, Stuttgart, Germany, September 27-29, p. 215-216.

Wilhite D. and M. Hayes, 2005. Drought Management: Moving from Crisis to Risk Management. Proceedings of the Rocky Mountain Mineral Law Foundation, Portland, OR, July 23.

Zalud, Z., M. Trnka, M. Dubrovsky, M. Svoboda, M. Hayes, M. Mozny, D. Semeradova, and P. Hlavinka, 2005. Methodology for Assessment of Drought Episodes Under Present and Expected Climate Conditions. Proceedings of the 15th Czech Bioclimatological Conference, Kotiny-Brno, Czech Republic, September 12-14, p. 91.

Hayes, M. J., M. D. Svoboda, C. L. Knutson, and D. A. Wilhite, 2004. Estimating the Economic Impacts of Drought. Proceedings of the 14th Conference on Applied Climatology, Seattle, WA, January 11-15.

Svoboda, M. D., M. J. Hayes, D. A. Wilhite, and T. Tadesse, 2004. Recent Advances in Drought

Monitoring. Proceedings of the 14th Conference on Applied Climatology, Seattle, WA, January 11-15.

Svoboda, M. D. and M. J. Hayes, 2004. Drought Assessment: The U.S. Drought Monitor and Beyond. Proceedings of the International Conference on Drought and Drought Monitoring in Agriculture, Vienna, Austria, June 7.

Tadesse, T., J. F. Brown, and M. J. Hayes, 2003. Assessing and Monitoring Drought with Climate, Satellite, and Other Geophysical Data Sets Using Data Mining Techniques. Proceedings of the 30th International Symposium on Remote Sensing of Environment, Honolulu, HI, November 10-14.

Tadesse, T., J. F. Brown, and M. J. Hayes, 2003. Modeling Drought with Climate, Satellite, and Other Land Data Sets Using Data Mining Techniques. Proceedings of the 7th World Multi-Conference on Systemics, Cybernetics, and Informatics, Orlando, FL, July 27-30, p. 198-201.

Waltman, W. J., S. Goddard, S. E. Reichenbach, M. D. Svoboda, M. J. Hayes, and J. S. Peake, 2003. Patterns and Trends of Soil Climate Regimes and Drought Events in the Northern Great Plains. Papers of the Applied Geography Conferences, 26: 333-342.

Hayes, M., 2002. Public Health Impacts of Drought. Proceedings of the 16th International Conference on Biometeorology, Kansas City, MO, October 28-November 1, 2002.

Hayes, M. and M. Svoboda, 2002. Determining Drought Severity and Extent: the U. S. National Drought Monitor. Proceedings of the 16th International Conference on Biometeorology, Kansas City, MO, October 28-November 1, 2002.

Hayes, M., M. Svoboda, W. Waltman, S. Goddard, and K. Hubbard, 2002. Monitoring Droughts with Improved Resolution. Proceedings of the 13th Conference on Applied Climatology, Portland, OR, May 13-16, 2002, p. 207-208.

Svoboda, M., M. Hayes, and R. Tinker, 2002. Three Years and Counting: What's New with the Drought Monitor? Proceedings of the 13th Conference on Applied Climatology, Portland, OR, May 13-16, 2002, p. 223-226.

Tadesse, T., M. Hayes, D. Wilhite, and S. Harms, 2002. Data Mining and Knowledge Discovery of Drought in Nebraska. Proceedings of the 16th International Conference on Biometeorology, Kansas City, MO, October 28-November 1, 2002.

Hayes, M., 2001. Equipping Your Personal Drought Monitoring Tool Box. Proceedings of the American Society of Civil Engineers Conference, Houston, TX, October 11-13, 2001.

STATION PROJECTS

D. Wilhite and M. Hayes. Drought Management: Mitigation, Planning, and Policy Options. 2007-2011. NEB-38-054.

D. Wilhite and M. Hayes. Drought: Response and Policy Implications. 2001-2006. NEB-27-007.

PRESENTATIONS

2008

16 “invited” presentations
3 NDMC-organized workshop presentations
2 volunteer presentations
1 conference poster presentation

2007

12 “invited” presentations
2 drought workshop presentations (organized by the Mni Sose Intertribal Water Rights Coalition)

2006

11 “invited” presentations
12 NDMC-organized workshop presentations
4 conference poster presentations

2005

16 “invited” presentations
4 NDMC-organized workshop presentations
2 conference oral presentations

2004

12 “invited” presentations
4 NDMC-organized workshop presentations
2 conference oral presentations

NDMC-ORGANIZED WORKSHOPS (NATIONAL)*

2008

Kansas City, MO: June 18-19
Maui, HI: June 24
Hawaii, HI: June 26
Lincoln, NE: October 20-24

2007

Rapid City, SD: April 11
Portland, OR: October 10-11

2006

El Reno, OK: March 8-9
DeKalb, IL: March 13-14
Roswell, NM: May 23
North Platte, NE: June 5
Chadron, NE: June 6

2005

Billings, MT: February 22-23

Kansas City, MO: March 24

Washington, D.C.: March 28

2004

Flagstaff, AZ: June 29-30

*Includes my involvement with organization and participation

INTERNATIONAL PROGRAM ACTIVITIES

Drought Planning Workshops

Budapest, Hungary, 9/97

Cuernavaca, Mexico, 10/98*

Recife, Brazil, 12/98

Fortaleza, Brazil, 12/98

Budapest-Felsögöd, Hungary, 4/00

Culiacán, Mexico, 5/00*

Rabat, Morocco, 2/01

Prague, Czech Republic, 5/03

Vienna, Austria, 6/04

*Workshops organized by the NDMC

Recent International Travel

2009. **Mali.** Drought Monitor Workshop, Bamako, Mali, September 14-17.

2008. **Australia.** Joint USA-Australia Drought Workshop: "Drought in a Changing Climate, Sharing Management Approaches", Canberra, Australia, November 17-19.

2007. **Morocco.** Working with USAID to make an assessment of Morocco's drought management strategies. Two trips: August 20-29 and December 1-15.

2006. **Spain.** Participated in the Mediterranean Drought Forum in Madrid, February 14.

2005. **China.** Participated in the China-U.S. Drought Monitoring and Assessment Workshop in Beijing, November 15-17.

2005. **Bermuda.** Participated in the Workshop on Assessing, Modeling, and Monitoring the Impacts of Extreme Climate Events in Hamilton, October 13-14.

2004. **Austria.** Participated in the "Drought and Drought Monitoring in Agriculture" international workshop in Vienna, June.

2004. **Czech Republic.** Participated in discussions related to the NATO Science Program project with colleagues from Mendel University and had a meeting at the Hydrometeorological Institute in Prague, June.

STUDENTS

Served on M.S. Committees for:

Polly Ann Najarian (2000)

James George (2001, UNO)

Melissa Melvin (2006)

Jeff Nothwehr (2007)

Prabhakar Shrestha (2009)

Sandra Jones (current-advisor)

Served on Ph.D. Committees for:

Olga Wilhelmi (1999)

Tsegaye Tadesse (2002)

Hong Wu (2002)

Patrick Guinan (2004, University of Missouri-Columbia)

Donna Woudenberg (2006)

Yacoubou Tawaye (2007)

Eric Hunt (current)

Matthew Collier (current, University of Oklahoma)

Sharmistha Swain (current)

Jane Okalebo (current-advisor)

Crystal Bergman (current-advisor)

PROFESSIONAL SERVICE

Board Member, 2007-2010, Center for Great Plains Studies Board of Governors.

Member, 2009-2010, Nominating Committee, Center for Great Plains Studies.

Member, 2007-2009, Scholarship Committee, Center for Great Plains Studies.

Reviewer, March 2007, National Research Council Review Team for the Climate Change Science Program's Synthesis and Assessment Product 3.3: Weather and Climate Extremes in a Changing Climate.

Member, 2007-present, Nebraska Climate Assessment and Response Committee.

Member, 2006-present, National Integrated Drought Information System Implementation Team.

Co-Chair, 2006-present, Engaging the Preparedness Communities Working Group, National Integrated Drought Information System.

Member, 2007-2009, Integration Advisory Team, School of Natural Resources, University of Nebraska-Lincoln.

Member, 2006-2012, Promotion and Tenure Committee, School of Natural Resources, University of Nebraska-Lincoln.

Member, 2001-2008, Outreach Committee, School of Natural Resources, University of Nebraska-Lincoln.

Co-Chair, 2003-2004, Stakeholder Processes and Needs Working Group, WGA/NOAA National Integrated Drought Information System.

Member, 2003-2004, WGA/NOAA National Integrated Drought Information System Core Team.

Member, 2003-2004, WGA/NOAA National Integrated Drought Information System Interdisciplinary Team.

Member, 2001-2005, Web Site Development Subcommittee, Interim National Drought Council.

Member, 2001-2005, Monitoring and Prediction Subcommittee, Interim National Drought Council.

Co-author, 1999-2005, U.S. Drought Monitor (<http://drought.unl.edu/dm/>).

Co-author, 2002-2005, North American Drought Monitor (<http://www.ncdc.noaa.gov/oa/climate/monitoring/drought/nadm/>)

Member, 2000-present, Nebraska Risk Assessment Committee.

NDMC Liaison, 1998-present, Nebraska Agriculture, Natural Resources, and Wildlife

Subcommittee.

NDMC Liaison, 1998-present, Nebraska Municipal Water Supply, Health, and Energy
Subcommittee.

Member, 1996-present, Nebraska Water Availability and Outlook Committee.

Member, 1999-2000, Agriculture Working Group, National Drought Policy Commission.

Member, 1997-1999, Preparedness and Mitigation Working Group, Western Drought
Coordination Council.