

**BEFORE THE  
WYOMING ENVIRONMENTAL QUALITY COUNCIL**

IN RE Willow Creek Watershed General Permit,	)	
Pumpkin Creek Watershed General Permit,	)	
and Four Mile Creek Plan	)	Docket No. 06-3815
	)	Docket No. 06-3816
	)	Docket No. 06-3817

**WYOMING OUTDOOR COUNCIL'S  
LIST OF EXPERT WITNESSES**

Comes now the Wyoming Outdoor Council and hereby presents its list of expert witnesses that it may call to testify in the contested case hearing set in this matter to commence December 17, 2007. The witnesses are as follows:

1. Dr. Ginger Paige  
Assistant Professor. Water Resources  
Dept. of Renewable Resources  
P.O. Box 3354  
University of Wyoming  
Laramie, WY 82071-3354

Her resume is attached.

2. Dr. Larry C. Munn  
Soil Science Division  
Dept. of Renewable Resources  
Dept. 3354  
1000 University Avenue  
Laramie, WY 82071

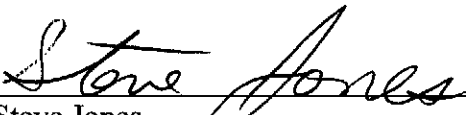
His resume is attached.

Wyoming Outdoor Council (WOC) is not specifically aware at this time of the substance of the testimony of these witnesses. However, Drs. Paige and Munn have been in communication with the Department of Environmental Quality, Water Quality Division (DEQ/WQD), regarding the appropriate effluent limitation standards for

watershed general permits for coal bed methane produced water discharges, including the Pumpkin Creek and Willow Creek Watershed General Permits. They have also offered their assistance and opinions in helping DEQ to determine the most appropriate methodologies to be used to protect agricultural uses in these drainages. It is expected they will testify along the same lines as revealed in their written communications with the DEQ/WQD. WOC does not have those communications at this time, but is in the process of discovering them from the DEQ/WQD. Once WOC acquires such information, it will be shared with the Intervenors as well.

Dated this 22<sup>nd</sup> day of August 2007:

Respectfully submitted,

  
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Watershed Protection Program Attorney  
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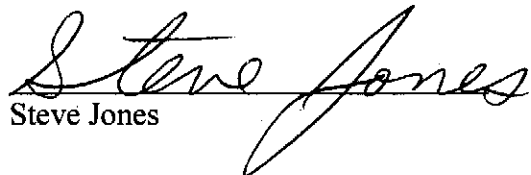
## CERTIFICATE OF SERVICE

I hereby certify that I served the foregoing Wyoming Outdoor Council's List of Expert Witnesses by placing a copy of the same in the U.S. mail, postage prepaid, on the 22<sup>nd</sup> day of August, 2007, addressed to the following:

Michael Barrash  
Assistant Attorney General  
Wyoming Attorney General's Office  
123 Capitol Bldg.  
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Steve Jones

## **LARRY C. MUNN**

Soil Science Division  
Department of Renewable Resources  
Dept 3354  
1000 University Ave  
Laramie, WY 82071  
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E-mail: lcmunn@uwyo.edu

### **EDUCATION:**

Ph.D. 1977 Crop and Soil Science (Range Soils), Montana State University  
M.S. 1974 Natural Resources (Forest Soils), Ohio State University  
B.S. 1972 Agronomy (Soils), Ohio State University

### **PROFESSIONAL EXPERIENCE:**

Professor of Soil Science, University of Wyoming, Laramie, Wyoming. (Assistant Professor 1981-1986; Associate Professor 1986-1991). (Interim Head October 1998-July 1999).

Research (45%): Soil genesis, morphology and classification; soil- native plant community relationships, mineland reclamation, coal bed methane development effects on soils and landscapes.

Teaching (45%): SOIL 4120/5120 Soil Morphology, Classification and Genesis;  
AECL/SOIL2010 Introduction to Soil Science

### **AWARDS AND HONORS:**

Graduated Summa Cum Laude, Ohio State University, 1972

Ellbogen Award for Meritorious Classroom Teaching, 1993

College of Agriculture Outstanding Teacher, 1999

### **PROFESSIONAL COMMITTEES:**

Western Regional Coordinating Committee on the National Cooperative Soil Survey (Chair, 1989-1990); Soils and Geomorphology Committee - American Society of Agronomy national committee; Soil Taxonomy Committee - National Cooperative Soil Survey; Soil Interpretations Committee - National Cooperative Soil Survey; International Committee on the Classification of Soil Families.

University Tenure and Promotion Committee (Member 1992-1994, 2001-2003; Chair 1993-1994); College of Agriculture Tenure and Promotion Committee, 1989-1991, 1997-1999.

#### RECENT REFEREED PUBLICATIONS:

Zhang, R., S. Rahman, G.F. Vance and L.C. Munn. 1995. Geostastical analyses of trace elements in soils and plants. *Soil Science*. 159:383-390.

Munn, L.C. 1995. Factors controlling distribution of selenium by geomorphic and pedologic processes in a semi-arid environment, Laramie Basin, Wyoming. p270-283. In G.E. Schuman and G.F. Vance (eds.) *Decades Later: a Time for Reassessment*. American Society for Surface Reclamation. Princeton, WV 24740.

Zhang, R., J.D. Hamerlinck, S.P. Gloss and L.C. Munn. 1996. Determination of non-point source pollution using GIS and numerical models. *J. Environ. Qual.* 25:411-418.

Rahman, S., L.C. Munn, R. Zhang and G.F. Vance. 1996. Wyoming Rocky Mountain forest soils: evaluating variability using statistics and geoststistics. *Can. J. Soil Sci.* 75:501-507.

Reddy, K.J, L.C. Munn and L. Wang 1996. Chapter 2. Chemistry and Mineralogy of Molybdenum in soils. In U.G. Ghupta (ed) *Soil and Plant Molybdenum and its Significance in Crops and Livestock*. Cambridge University Press. New York. pp 4-22.

Rahman, S., L.C. Munn, G.F. Vance and C. Arneson. 1997. Wyoming Rocky Mountain forest soils: mapping using an ARC/INFO geographic information system. *Soil Sci. Soc. Am. J.* 61:1730-1737.

Young, J.A., G.F. Vance, L.C. Munn, B.M. Christensen and M.S. Schaad. 2000. A Geographic Information System for identification of potential alternative crops utilizing soil and climatic variables in the Big Horn Basin, Wyoming. *American Journal of Alternative Agriculture* 15:160-170.

Dr. Ginger Paige  
Assistant Professor  
Water Resources  
Department of Renewable Resources  
P. O. Box 3354  
University of Wyoming  
Laramie, WY 82071-3354  
Phone: 307-766-2200  
Email: gpaige@uwyo.edu

## EDUCATION

2000 Ph.D. Watershed Management, University of Arizona, Tucson, AZ  
*Dissertation:* Measurement and modeling of the spatial variability of infiltration on rangelands.

1992 M.S. Soil Physics, University of Massachusetts, Amherst, MA

1984 B.A. Political Science, The Colorado College, Colorado Springs, CO

## PROFESSIONAL EXPERIENCE

*October 2004 - present:* Assistant Professor, Department of Renewable Resources, University of Wyoming, Laramie, WY.

Developing water resources extension program for the state of Wyoming. Co-PI on Joint Fire Science Program funded project to quantify runoff and erosion processes on semi-arid rangelands following wildfires.

*October 2002- September 2004:* Assistant Research Scientist, Department of Watershed Management, University of Arizona and USDA-ARS Southwest Watershed Research Center, Tucson, Arizona.

Conducted research to measure and model hydrologic and erosion processes on rangeland watersheds at a variety of scales.

*2000- 2002:* Research Associate, Department of Hydrology and Water Resources, University of Arizona and USDA-ARS Southwest Watershed Research Center, Tucson, Arizona.  
Conducted collaborative research as part of SAHRA, a NSF Science and Technology Center, to measure and model of the effects of the spatial variability of infiltration capacity on runoff and erosion on semi-arid rangelands at a variety of scales.

*1996-2000:* Senior Research Specialist, Department of Watershed Management, University of Arizona and USDA-ARS Southwest Watershed Research Center, Tucson, Arizona.

Conducted research on measurement and modeling of hydrologic processes on rangeland watersheds at a variety of scales. Designed, built and tested computer controlled variable

intensity rainfall simulator to measure hydrologic and erosion processes on rangeland watersheds.

*1992-1996:* Soil Scientist, GS-09, USDA-ARS Southwest Watershed Research Center, Tucson, Arizona.

Developed a prototype Decision Support System to evaluate trench cap designs for low-level radioactive waste.

*1988-1992:* Research Assistant, Department of Plant and Soils, University of Massachusetts, Amherst, Massachusetts.

Managed Soil Physics Laboratory and conducted laboratory procedures. Designed and implemented study to characterize soil hydraulic properties

*1992 (Jan. - May):* Teaching Assistant, Soil Physics, Department of Plant and Soils, University of Massachusetts, Amherst, Massachusetts.

Designed and taught curriculum for laboratory section of graduate level course in soil physics.

*1987 (June -Oct.):* Peace Corps Training Co-coordinator, Ouezzendougou, Mali, West Africa  
Co-coordinator for Appropriate Technology, Mali in County Training. Developed curriculum for new program section, wrote and implemented lesson plans, and evaluated trainees.

*1986-1987:* Peace Corps Agriculture Extension Agent, Dire, Mali, West Africa.  
Designed and coordinated an irrigation project and introduced appropriate arid lands agriculture, soil and water management techniques.

*1984-1986:* Peace Corps Community Development Agent, Bougouni, Mali, West Africa.  
Wrote project proposals and managed projects for the integration of appropriate technologies into schools and communities. Conducted training of trainer workshops for dissemination of fuel efficient cookstoves, wrote proposal and managed project for the construction of improved reinforced wells for communities and livestock funded by U.S. AID.

#### HONORS AND AWARDS

Outstanding Graduate Student, Dept. of Watershed Management, Univ. of Arizona, 2000  
University of Arizona, Superior Performance 1996, 1997, 1998, 1999, 2000  
USDA, Outstanding performance award, 1996  
USDA, Superior performance award, 1994 and 1995  
Lotta Crabtree Fellowship for Agricultural Research 1991-1992

#### SPECIFIC AREAS OF INTEREST

Watershed and rangeland hydrology  
Landuse management practices

Effects of fire on rangeland hydrologic and erosion processes  
Characterization of soil hydraulic properties  
Soil moisture measurement

Societies: American Water Resources Association, American Geophysical Union

## PUBLICATIONS

### Refereed Journals:

Paige, G.B., J.J. Stone, J.R. Smith, and J.R. Kennedy. 2003. The Walnut Gulch Rainfall Simulator: A computer controlled variable intensity rainfall simulator. *Applied Engineering in Agriculture* 20(1):25-31.

Paige, G.B., J.J. Stone, D.P. Guertin, and L.J. Lane. 2002. A strip model approach to parameterize a coupled Green-Ampt kinematic wave model. *JAWRA* 38(5): 1363-1378.

Paige, G.B. 2000. Measurement and modeling of the spatial variability of infiltration on rangeland watersheds. Ph.D. Dissertation. University of Arizona. pp. 283.

Paige, G.B., J.J. Stone, and L.J. Lane. 1996. Calibration and testing of simulation models for evaluation of trench cap designs. *Journal of Environmental Quality* 26(1):136-144.

Paige, G.B., J.J. Stone, D.S. Yakowitz, and L.J. Lane. 1996. Evaluation of a prototype decision support system for selecting trench cap designs. *Journal of Environmental Quality* 26(1):127-135.

Paige, G. B. and D. Hillel. 1993. Comparison of three methods for assessing soil hydraulic properties. *Soil Science* 155:175-189.

### In progress:

Keefer, T.O. and G.B. Paige. Comparison of responses from multiple soil moisture sensors installed in a semi-arid shrub dominated rangeland site. *J. Vadose Zone Hydrology (invited - in progress)*.

Stone, J.J., G.B. Paige, D.P. Guertin, and H. Blumenfeld. Post wild fire runoff and erosion on a semi-arid grassland in southeastern Arizona. *J. Range Manage. (in review)*.

Paige, G.B., J.J. Stone, and D.P. Guertin. Two approaches to configure and parameterize a distributed hydrologic model. *(in progress)*.

Paige, G.B., J.J. Stone, and D.P. Guertin. Infiltration Studies: Relationship between point and plot scale measurements *(in progress)*.



Proceedings:

G. B. Paige, J. J. Stone, and D. P. Guertin. Evaluation of post-wildfire runoff and erosion on semiarid ecological sites. Biodiversity and Management of the Madrean Archipelago II: Connecting Mountain Islands and Desert Seas, May 11-14, 2004, Tucson, AZ.

Paige, G.B., J.J. Stone, D. P. Guertin, R. McGee, and H. Blumenfeld. 2003. Runoff and erosion on a semi-arid grassland after a wildfire. Second International Wildfire Ecology and Fire Management Congress and Fifth Symposium on Fire and Forest Meteorology, November 16-20, 2003. Orlando, Florida. American Meteorological Society.

Paige, G.B. and J.J. Stone. 2003. Infiltration and runoff: Point and plot scale. Renard, K.G., McElroy, S.A., Gburek, W.J., Canfield, H. E. and Scott, R. L., eds. First Interagency Conference on Research in the Watersheds, October 27-30, 2003. U.S. Department of Agriculture, Agricultural Research Service. pp. 186-191.

Stone, J.J. and G.B. Paige. 2003. Variable rainfall intensity rainfall simulator experiments on semi-arid rangelands. Renard, K.G., McElroy, S.A., Gburek, W.J., Canfield, H. E. and Scott, R. L., eds. First Interagency Conference on Research in the Watersheds, October 27-30, 2003. U.S. Department of Agriculture, Agricultural Research Service. pp. 83-88.

Bryant, R., D. Thoma, M.S. Moran, C.D. Holifield, D.C. Goodrich, T.O. Keefer, G.B. Paige, D. William, and S.M. Skirvin. 2003. Evaluation of hyperspectral, infrared temperature and radar measurements for monitoring surface soil moisture. Renard, K.G., McElroy, S.A., Gburek, W.J., Canfield, H. E. and Scott, R. L., eds. First Interagency Conference on Research in the Watersheds, October 27-30, 2003. U.S. Department of Agriculture, Agricultural Research Service. pp. 528-533.

Kennedy, J.R., T.O. Keefer, G.B. Paige, and F. Barnes. 2003. Evaluation of dielectric constant-based soil moisture sensors in a semi-arid rangeland. Renard, K.G., McElroy, S.A., Gburek, W.J., Canfield, H. E. and Scott, R. L., eds. First Interagency Conference on Research in the Watersheds, October 27-30, 2003. U.S. Department of Agriculture, Agricultural Research Service. pp. 503-508.

Paige, G.B., J.J. Stone, L.J. Lane, and D.P. Guertin. 2000. Infiltration and runoff response on a complex soil plot. Proceedings ASCE Watershed Management 2000, Fort Collins, CO. June 21-24, 2000.

Stone, J.J., G.B. Paige, and I. Sanchez Cohen. 1999. Planeacion de investigacion con simuladores de lluvia. In Sanchez Cohen, I., J.J. Stone, and R. Jasso Ibarra (Eds.) *Uso de lluvia artificial para parametrizar modelos de procesos hidrológicos*. SAGAR - INIFAP - CENID RASPA, Mexico, pp 7-14.

Paige, G.B., J.J. Stone, L.J. Lane, and D.S. Yakowitz. 1998. Overview of a Decision Support System for the Evaluation of Landfill Cover Designs. In El-Swaify, S. and Yakowitz, D.S. (Eds.). *Multiple Objective Decision Making in Land, Water, and Environmental Management*.

Proc. of 1st International Conference on Multiple Objective Decision Support Systems for Land, Water and Environmental Management: Concepts, Approaches, and Applications. Honolulu, HI. July, 1995. St. Lucie Press, FL. pp 153-165.

Paige, G.B. and J.J. Stone. 1996. Spatial and temporal variability of infiltration on rangelands. Proc. USDA-ARS Workshop on Real World Infiltration. Pingree Park, CO. July 23-26, 1996, Pub. By Colorado Water Resources Research Institute, Information Series No. 86, pp. 109-122.

Stone, J.J. and G.B. Paige. 1996. Rangeland rainfall simulator experiments. Proc. USDA-ARS Workshop on Real World Infiltration. Pingree Park, CO. July 23-26, 1996, Pub. By Colorado Water Resources Research Institute, Information Series No. 86, pp. 6-24.

Goodrich, D.C., R.E. Smith, D.D. Bosch, J.J. Stone, G.B. Paige, J.R. Simanton, W.E. Emmerich, T.O. Keefer, R.A. Shillito, C.L. Unkrich. 1996. Infiltration-scale interactions. Proc. USDA-ARS Workshop on Real World Infiltration. Pingree Park, CO. July 23-26, 1996, Pub. By Colorado Water Resources Research Institute, Information Series No. 86, pp. 122-129.

Paige, G.B., J.J. Stone, T.E. Hakonson, and L.J. Lane. 1995. A decision tool for selecting trench cap designs. Proceedings of the 17th Annual Department of Energy Low-Level Radioactive Waste Management Conference, December 12-14, 1995, Phoenix, AZ, INEL, Idaho Falls, ID.

Lane, L.J., M.H. Nichols, and G.B. Paige. 1995. Modeling erosion on hillslopes: Concepts, theory, and data. In Binning, P., H. Bridgman, and B. Williams (eds.) Proceedings of the International Congress on Modelling and Simulation (MODSIM '95) November 27-30, 1995, University of Newcastle, Newcastle, Australia. Uniprint, Perth Australia.

Paige, G.B., T.E. Hakonson, D.S. Yakowitz, L.J. Lane, and J.J. Stone. 1994. A prototype decision support system for the evaluation of shallow land waste disposal trench cap designs. Proceedings ER '93 Environmental Remediation Conference, Augusta, GA, October 1993 pp. 1111-1117.

Paige, G. B. and P.L.M. Veneman. 1993. Percolation tests and hydraulic conductivity. Soil Survey Horizons 34(1):1-3.

## PRESENTATIONS

Paige, G.B. and J.J. Stone. "Infiltration and runoff: Point and plot scale." First Interagency Conference on Research in the Watersheds, Benson, AZ. October 27-30, 2003. *oral presentation*

Paige, G.B., J.J. Stone, D. P. Guertin, R. McGee, and H. Blumenfeld. "Runoff and erosion on a semi-arid grassland after a wildfire." Second International Wildfire Ecology and Fire Management Congress and Fifth Symposium on Fire and Forest Meteorology, Orlando, FL. November 16-20, 2003. *oral presentation*

Stone, J.J. and G.B. Paige. "Variable rainfall intensity rainfall simulator experiments on semi-arid rangelands." First Interagency Conference on Research in the Watersheds, Benson, AZ. October 27-30, 2003. *oral presentation*

Paige, G.B., Stone, J.J., and Guertin, D.P. "Rainfall simulator experiments to parameterize a distributed hydrologic model." Am. Water Resour. Assoc. Annual Water Resources Conf., Albuquerque, NM. Nov. 12-15, 2001. *oral presentation*

Paige, G.B., J.J. Stone, and D.P. Guertin. "Spatial variability of infiltration on semi-arid rangelands." NRCS-ARS-CSREES Partnering Workshop, Tucson, AZ November 26-30, 2001. *poster presentation*

Paige, G.B., J.J. Stone, L.J. Lane, and D.P. Guertin. "Infiltration and runoff response on a complex soil plot." ASCE Watershed Management 2000, Fort Collins, CO. June 21- 24, 2000. *oral presentation*

Paige, G.B. and J.J. Stone. "Spatial and temporal variability of infiltration on rangelands." USDA-ARS Workshop on Real World Infiltration. Pingree Park, CO. July 23-26, 1996. *oral presentation*

Paige, G.B., J.J. Stone, T.E. Hakonson, and L.J. Lane. "A decision tool for selecting trench cap designs." Proceedings of the 17th Annual Department of Energy Low- Level Radioactive Waste Management Conference, Phoenix, AZ, December 12-14, 1995. *oral presentation*

Paige, G.B., T.E. Hakonson, D.S. Yakowitz, L.J. Lane, and J.J. Stone. "A prototype decision support system for the evaluation of shallow land waste disposal trench cap designs". Proceedings ER '93 Environmental Remediation Conference, Augusta, GA. October 1993. *poster presentation*

Paige, G. B. and D. Hillel. "Comparison of methods for assessing soil hydraulic properties." American Society of Agronomy Annual Meetings, Denver, CO October 1991. *poster presentation*

Baker, R.S. and G.B. Paige. "Site suitability assessment for on site sewage disposal." Soil Science Society of Southern New England Conference, Sturbridge, MA November 1990. *oral presentation*

#### Workshops/Demonstrations:

USDA-ARS, SWRC /ISCO Workshop "Soil Erosion Network: Soil erosion under climate change" November 2003.

*Field Demonstration:* Presentation and demonstration of a variable intensity rainfall simulator for quantifying hydrologic and erosion processes on ecological sites in semi-arid rangeland watersheds.

First Interagency Conference on Research in the Watersheds, Benson, AZ. October, 2003.

*Field Demonstration:* Presentation and demonstration of a variable intensity rainfall simulator for quantifying hydrologic and erosion processes on ecological sites in semi-arid rangeland watersheds.

University of Arizona Cooperative Extension In-Service "Linking Physical and Ecological Processes on Southwest Watersheds." October, 2001

*Field Demonstration:* Presentation and demonstration of a variable intensity rainfall simulator for quantifying hydrologic and erosion processes on ecological sites in semi-arid rangeland watersheds.