



FOUR CORNERS GEOLOGICAL SOCIETY NEWSLETTER

January 2007

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Four Corners Geological Society

January Meeting and Presentation

DATE:

Friday, January 19, 2006

SPEAKER: Dr. Grant A. Meyer, Department of Earth and Planetary Sciences

TOPIC: "Fire, Climate, and Episodic Erosion in the Interior Western U.S. Cordillera"

PLACE: Fort Lewis College, Durango, Colorado

AGENDA:

4:00 - 6:00 PM – Social Hour, College Union Building, Student Memorial Lounge

6:30 PM Dinner – Yummy Grub

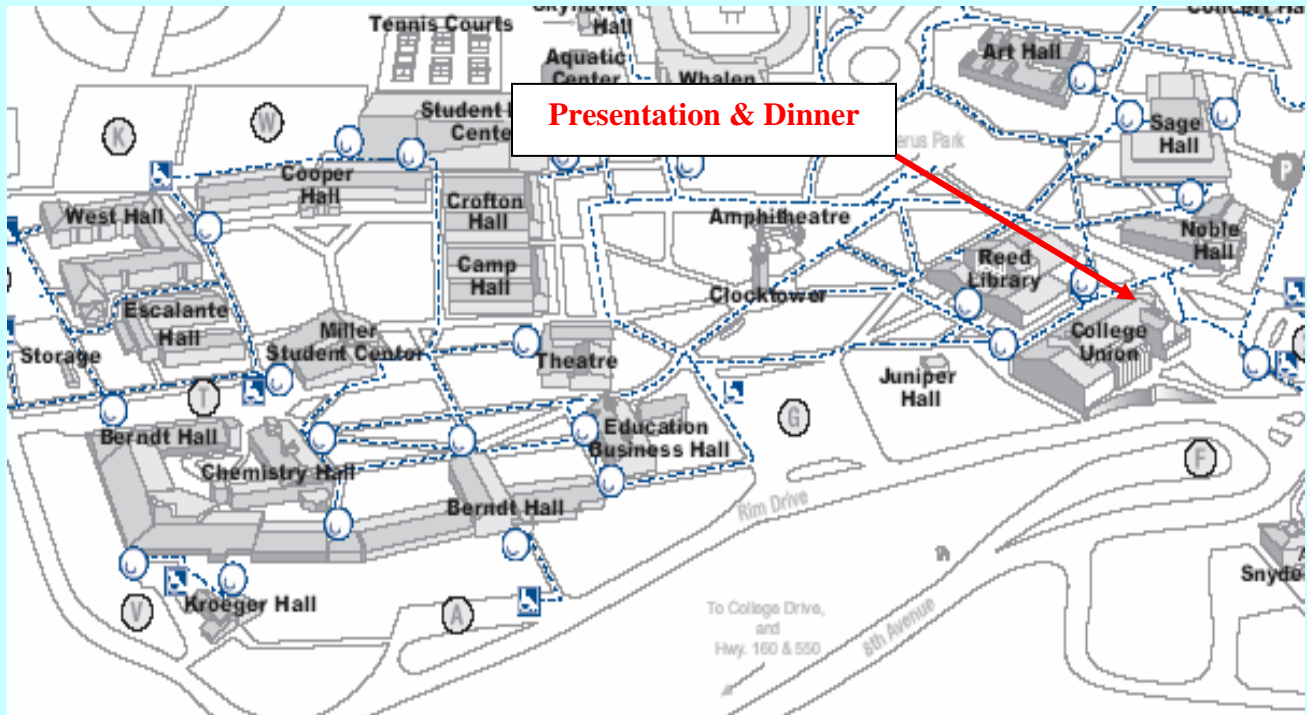
7:30 PM Presentation

COSTS: \$20.00 per person (dinner and talk), \$2.00 per person (talk only), students free (talk only)

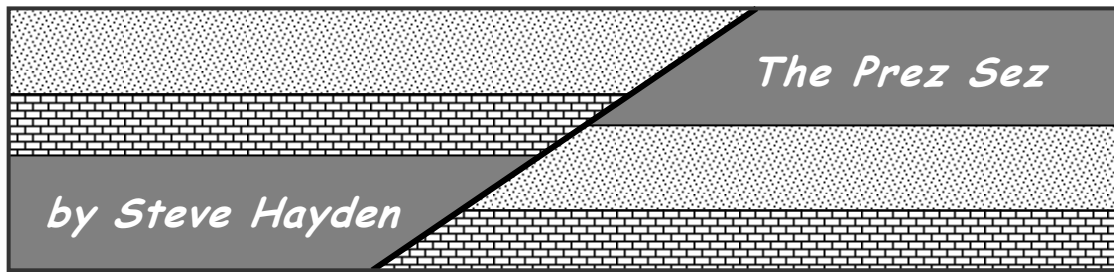
Reservations! For the meeting and presentation should be made by Wednesday, Jan. 17.

Farmington Contact: Steve Hayden – email: steven.hayden@state.nm.us, phone: (505) 334-6178

Durango Contact: Kim Hannula – email: hannula_k@fortlewis.edu, phone: (970) 247-7463



FLC Campus



Hello and welcome to 2007. I hope everyone has had a good start to the New Year.

This month the speaker is an old friend of mine, and Kim Hannula's: Dr Grant Meyer from the University of New Mexico. Grant is a geomorphologist who has studied the effects of fire on the landscape throughout the west. He did his PhD in Yellowstone after the devastating fires denuded large areas a couple of decades ago. I highly recommend everyone attend his talk. His scope ties in climate cyclicity, fire severity and sedimentation/erosion rates. This topic has much local application after the fire seasons in Colorado and New Mexico over the last several years.

Grant is also a great guy and a fly fisherman without peer.

I hope to see you all at Fort Lewis on the 19th.

Steve



Fire, Climate, and Episodic Erosion in the Interior Western U.S. Cordillera

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ABSTRACT

Many studies have documented extreme transient increases in erosion rates following severe forest fires in mountain regions, resulting from dramatic increases in surface runoff generation and soil erodibility combined with smooth overland flow paths. With intense precipitation, widespread runoff leads to rill and gully incision, sediment bulking and debris-flow transport. Postfire erosion also stems from loss of root strength leading to large colluvial failures and other mass movements such as dry ravel, depending on the climatic and geomorphic setting. For example, postfire mass failures in central Idaho yielded up to 44,000 Mg km⁻² from small basins, equivalent to several thousand years of sediment yield at low rates measured over a few decades in unburned watersheds. Erosion by storm events is often modeled as a stochastic process, but drought and fire are not random; like storms, they are often strongly clustered in time because of climatic controls.

Increased wildfire activity has accompanied late 20th-century to present warming across the diverse conifer forests of western North America. In ponderosa pine forests in particular, large, severe wildfires and ensuing erosion and debris flows appear unprecedented in light of tree-ring fire-scar records, and are often attributed to increased stand density following Euro-American settlement and fire suppression starting in the late 1800s. Yet, presettlement periods in fire-scar records correspond to mostly cooler Little Ice Age climates, when we expect that severe fires may be less probable. AMS ¹⁴C dating of fire-related alluvial-fan deposits provides a longer-term context for assessing links between fire, climate, erosion, and anthropogenic change. Despite contrasts in climate, forest types, and characteristic fire regimes, severe multidecadal droughts during the Medieval period 1050-650 cal yr BP produced large fire-related debris flows in subalpine Yellowstone, drier ponderosa-mixed conifer forests in central Idaho, and mixed-conifer forests in the monsoonal climate of the Sacramento Mountains, New Mexico. In central Idaho, fire-related debris-flow deposits from the Medieval period make up ~25% of the sampled fan deposit thickness over the last 4000 yr. In both Yellowstone and the Sacramento Mountains, very rapid fan aggradation between ~5500 and 4000 cal yr BP implies the highest slope erosion rates following the Pleistocene-

Holocene transition. Fire-induced deposits comprise ~30% of late-Holocene fan alluvium in Yellowstone, where extremely steep and erodible unvegetated volcanoclastic bedrock also contributes, and ~50% in central Idaho, where fire is key to mobilizing grussy colluvium. An unanswered question is whether long-term changes in fire regime linked to major climate changes also alter overall mountain denudation rates.

As greenhouse gas increases are virtually assured over the next century, impacts on fire and erosion have likely just begun. Earlier snowmelt accompanying warming lengthens the fire season in much of the Rocky Mountains, including YNP, central Idaho, and Colorado (Westerling et al. 2006). In ponderosa and similar forests where surface fires were suppressed by humans, increased stand density compounds the effect of warming. Increasing temperatures may also heighten precipitation intensity, producing greater postfire erosion. Although Holocene history provides imperfect analogs for a uniquely anthropogenic future, the sensitivity of fire regimes to past warming portends future increases in severe fires and geomorphic change.

SPEAKER BIOGRAPHY

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Educational history:

B.S. Geology, 1978, University of Idaho, Moscow

M.S. Earth Science, 1986, Montana State University

Thesis: Genesis and deformation of Holocene shoreline terraces, Yellowstone Lake, Wyoming

Ph.D. Geology, July 1993, Department of Earth and Planetary Sciences, University of New Mexico

Dissertation: Holocene and modern geomorphic response to forest fires and climate change in Yellowstone National Park

Post-PhD employment history:

Associate Professor, 2003-present, Dept. of Earth & Planetary Sciences, University of New Mexico.

Assistant Professor, 2000-2003, Dept. of Earth & Planetary Sciences, University of New Mexico.

Assistant Professor, 1999-2000, Department of Geography, University of Oregon.

Assistant Professor, 1993-1999, Department of Geology, Middlebury College, Vermont.

Selected publications:

- Persico, L.P., and Meyer, G.A. (in review), Relations between beaver, fluvial geomorphology, and climate over the Holocene in Yellowstone National Park, Wyoming: *Quaternary Research*.
- Amerson, B.E., Montgomery, D.R. and Meyer, G.A. (in revision), Relative size of fluvial and glaciated valleys in Central Idaho: *Geomorphology*.
- Pierce, K.L., Cannon, K.P., Meyer, G.A., Trebesch, M.J., and Watts, R. (in press), Post-glacial inflation-deflation cycles, tilting, and faulting in the Yellowstone caldera based on Yellowstone Lake shorelines: *U.S. Geological Survey Professional Paper*.
- Persico, L. Meyer, G., Frechette, J., New, J., and Hepler, C. (2005) Contrasts in late Pleistocene to Holocene fluvial behavior along the middle Rio Chama: New Mexico Geological Society, 56th Field Conference Guidebook, Geology of the Chama Basin, p. 432-433.
- Pierce, J.L., Meyer, G.A., and Jull, A.J.T. (2004) Fire-induced erosion and millennial-scale climate change in northern ponderosa pine forests: *Nature*, v. 432, p. 87-90.
- Meyer, G.A. (2004) Yellowstone fires and the physical landscape, Ch. 3 in Wallace, L.L., ed., *After The Fires: The Ecology of Change in Yellowstone National Park*: New Haven, Yale University Press, p. 29-51.
- Meyer, G.A., Fawcett, P.F., and Locke, W.W. (2004) Late-Pleistocene equilibrium-line altitudes, atmospheric circulation, and timing of mountain glacier advances in the interior northwestern United States, in Haller, K., and Wood, S.H., eds., *Geological Field Trips in Southern Idaho, Eastern Oregon, and Northern Nevada*: Geological Society of America Field Guide, p. 61-66.
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- Marcus, W.A., Meyer, G.A., Nimmo, D.R. (2001) Geomorphic control of persistent mine impacts in a Yellowstone Park stream and implications for the recovery of fluvial systems, *Geology*, v. 29, n. 4, p. 355-358.
- Meyer, G.A. (2001) Recent large-magnitude floods and their impact on valley-floor environments of northeastern Yellowstone, *Geomorphology*, v. 40, p. 271-290.
- Meyer, G.A., Pierce, J.L., Wood, S.H., and Jull, A.J.T. (2001) Fires, storms, and sediment yield in the Idaho batholith, *Hydrological Processes*, v. 15, p. 3025-3038.

- Meyer, G.A., and Leidecker, M.E. (1999) Fluvial terraces along the Middle Fork Salmon River, Idaho, and their relation to glaciation, landslide dams, and incision rates: A preliminary analysis and river-mile guide, in Hughes, S.S., and Thackray, G.D., eds., *Guidebook to the Geology of Eastern Idaho*, Pocatello, Idaho Museum of Natural History, p. 219-235.
- Meyer, G.A., and Wells, S.G. (1997) Fire-related sedimentation events on alluvial fans, Yellowstone National Park, U.S.A., *Journal of Sedimentary Research*, v. A67, p. 776-791.
- Meyer, G.A., Wells, S.G., and Jull, A.J.T. (1995) Fire and alluvial chronology in Yellowstone National Park: Climatic and intrinsic controls on Holocene geomorphic processes, *Geological Society of America Bulletin*, v. 107, p. 1211-1230. (1997 Geological Society of America Kirk Bryan Award paper)
- Locke, W.W., and Meyer, G.A. (1994) A 12,000-year record of vertical deformation across the Yellowstone caldera margin: The shorelines of Yellowstone Lake, *Journal of Geophysical Research*, v. 99, n. B10, p. 20,079-20,094.
- Balling, R.C., Jr., Meyer, G.A., and Wells, S.G. (1992) Climate change in Yellowstone National Park: Is the drought-related risk of wildfires increasing? *Climatic Change*, v. 22, p. 34-35.
- Locke, W.W., Meyer, G.A., and Pings, J.C. (1992) Morphology of a post-glacial fault scarp across the Yellowstone (Wyoming) Caldera margin and its implications, *Bulletin of the Seismological Society of America*, v. 82(1), p. 511-516.
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General Announcements/News from other Geo-Societies

American Association of Petroleum Geologists

Mark your calendars now for the **4th annual AAPG Winter Education Conference, February 12-16, 2007** in Houston, Texas. There will be courses covering; subsurface mapping / reservoir characterization mapping, properties and volumes / tight gas sandstones / coalbed methane / risk analysis / interpreting rock physical properties from seismic amplitudes / 3D seismic attributes / seismic geomorphology and stratigraphy / log interpretation / advancements in petrophysics / and drill stem tests. Tuition is \$1295 for AAPG members and \$1395 for non-members, or \$325/day for individual courses. For more information, call toll-free 888-338-3387 or 918-560-2650. You can download a registration form at <http://www.aapg.org/education/wec.cfm>.

The AAPG Annual Convention and Exhibition will be held **April 1-4, 2007** in Long Beach, California. The theme of the Conference is, “Understanding Earth Systems, Pursuing the Checkered Flag. The Final Announcement has been published, listing sessions, speakers, short courses and fieldtrips. Go online to <http://www.aapg.org> for more information or to register.

Rocky Mountain Association of Geologists

The RMAG presents, “Extensional Tectonic Systems in Exploration and Production” a short course by Robert Hickman. The course will be held on Thursday, **February 8th, 2007** at the Denver Marriott City Center. Register online at <http://www.rmag.org>.

The RMS and SEPM present a half-day core workshop on the **Facies and Stratigraphy of the Lower Mesaverde, Southern Piceance Basin** on Tuesday, **February 13, 2007** at the USGS in Lakewood, Co. Register online at: <http://rmssepm.org/>.

The 13th annual RMAG/DGS 3-D **Seismic Symposium** will be held on Tuesday, **March 6, 2007** at the Marriott City Center in Denver. Register online at <http://www.rmag.org>. Contact either R. Randy Ray (rrandyray@aol.com) or Bill Pearson (bpearson@pearsontechnologies.com) for more information.

The Coalbed Methane Symposium will be held **June 4, 2007** at the Marriott City Center Hotel in Denver, Colorado. The symposium is sponsored by the RMAG and the Denver Geophysical Society. For more information contact Bruce Kelso, bsk@bry.com, 303-825-3344 or Bob Lamarre, lamarregeo@quest.net, 720-488-1396.

Southwest Hydrology and Arizona Hydrological Society

Call for abstracts for the **2007 Regional Water Symposium** to be held **August 29-Sept 1, 2007** at the Westin LaPaloma Resort & Spa in Tucson, Arizona. The theme of the symposium is, “Sustainable Water, Unlimited Growth, Quality of Life, Can We Have it All?”. The deadline to submit abstracts is February 2, 2007. Visit their website, www.watersymposium.org, to submit an abstract or propose a session.

Wyoming Geological Association

The theme of the 2007 WGA Field Conference, to be held **August 2-6, 2007**, will be, "The Powder River Basin: From the Margins Looking In". Field trips will circle the basin with excursions to the interior. Stops will include, but are not limited to, uranium solution mining, coal extraction, the Hot Springs Mammoth Site, outcrops on the west flank of the Black Hills, the Newcastle "Oil Mine", coalbed methane surface facilities, Salt Creek and the Teapot Dome. In conjunction with the Field Conference, the WGA plans to publish a guidebook entitled, "Wyoming Geology" and welcomes submissions on subjects preferably, but not necessarily consistent with, the theme of the conference. The **deadline for submission is March 1, 2007**. Abstracts should be e-mailed to jlawlor@gga-inc.com, phone (307) 265-9199. The Conference Chairman is Mark Milliken.



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MEMBERSHIP RENEWAL or APPLICATION for 2007

PAGE 1

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| <input type="checkbox"/> | ACTIVE MEMBER 1 | \$20.00 | Person holding a degree in geology or an allied science and receiving the FCGS Newsletter via <u>email</u> |
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MEMBERSHIP RENEWAL or APPLICATION for 2007 PAGE 2

My professional interests are:

I would like to include a Tax Deductible Contribution to the Four Corners Geological Society Foundation.

Amount of Donation: _____
(Please include a separate check made payable to the Foundation.)

In Memory of (optional): _____

To be used for (optional): _____

SIGNATURE: _____ DATE: _____

The dues year begins on January 1.
For dues paid after March 1, add a \$5 late fee (does not apply to new members).

Please print, complete and return **both pages** of this form with your check for dues made payable to:

**Four Corners Geological Society
P.O. Box 1501,
Durango, CO 81302**

Advertising rates for the Four Corners Geological Society newsletter:

Full Page Ad (7½" x 9½") \$100/mo. or \$1000/yr. Half Page Ad (7½" x 4½") \$50/mo. or \$500/yr.
¼ Page Ad (3½" x 4½") \$25/mo. or \$250/yr. Business Card (3½" x 2") \$10/mo. or 100/yr.

Odd sizes are \$3.50 per column inch per month, minimum \$10.00

For more information, please contact the FCGS Treasurer, (vacant). Proceeds will go toward the further development of the Society (i.e., offset meeting costs, publications, etc.).

Four Corners Geological Society

P.O. Box 1501, Durango, CO 81302

<http://www.canyonwinds.com/FCGS/index.html>

2006-07 Officers

President – Steve Hayden: phone: 505.334.6178, email: steve.hayden@state.nm.us

President-Elect – Kim Hannula: Phone: 970.247.7463, e-mail: hannula_k@fortlewis.edu

Secretary – Kim Gerhardt: Phone: 970.375.2700, e-mail: kd@mydurango.net

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