June 10, 2009

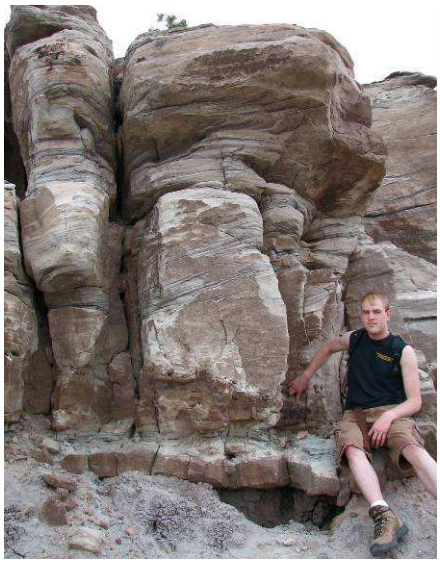
Dr. Mike Middleton
Dr. Holly Dolliver
Plant and Earth Science- Geology Program
University of Wisconsin- River Falls
410 S. 3rd St.
River Falls, WI 54022

Minnesota Groundwater Association--

Thank you again for the grant to support our geology field trip to Colorado and Utah. Our trip took place from May 17-30, 2009. We had a fun and motivated group of 15 students and had many exciting water-related adventures along our trip...some of which were planned…and others…well…unexpected.

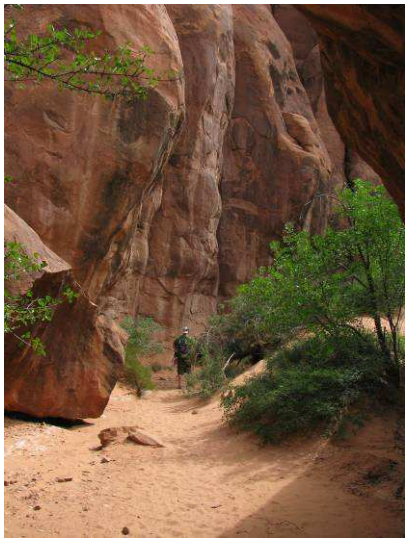
We experienced snow in the high altitude mountain passes (group picture in the snow at Vail Pass in Colorado), which afforded a nice opportunity to talk about the importance of snowmelt runoff in the west and particularly the dynamics of the Colorado River Watershed. We continued our trip, following the Colorado River westward, observing changes along the way (picture of meander bends in the Colorado River near Grand Junction, Colorado).

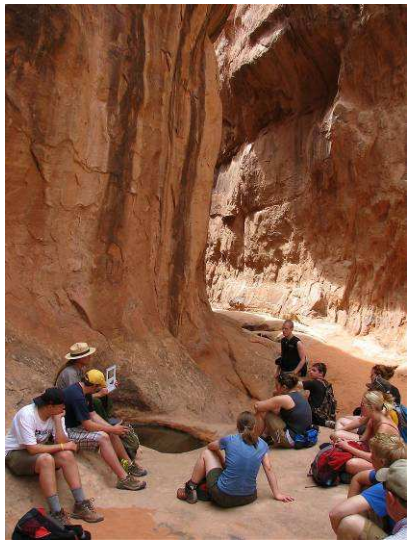
Near Grand Junction, Colorado we spent a day studying the sedimentary rocks of the Morrison Formation. The Morrison was deposited on a floodplain 150 million years ago. We observed overbank sediments, cross-bedded channel sands (see below picture) and channel lag deposits…including dinosaur bones!



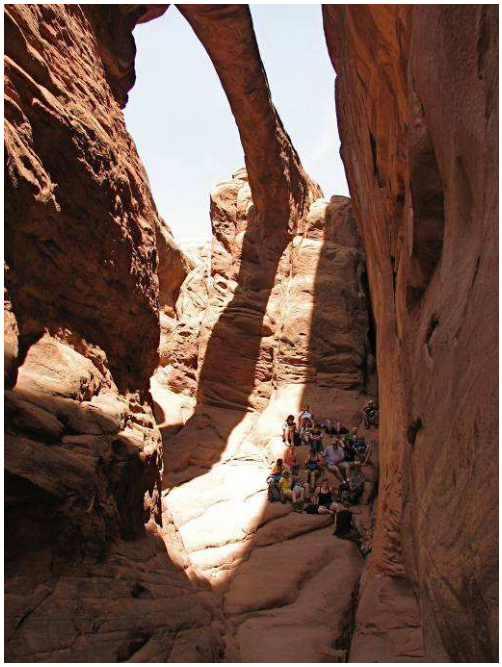
We traveled along the scenic Westwater Canyon toward Moab, Utah again following the Colorado River (photograph of the Colorado River in flood stage). Westwater Canyon was the site of our half-day whitewater rafting trip. Flooding conditions made for exciting rapids, but the steady rain wasn't appreciated. Our rafting guides shared their knowledge of Colorado River water quality initiatives, invasive species management, and local history. After watching "An American Nile" (part of the Cadillac Desert documentary) prior to the trip, it was nice for our students to have an opportunity to experience the river first hand that they had learned so much about preparing for the trip.

We spent a number of days in Arches and Canyonlands National Parks where we studied the stratigraphy and geomorphic processes creating the spectacular scenery. In Arches National Park, we hiked into the Fiery Furnace where the ranger described the intimate relationship of water to the development of the landscape. While hiking through the slot canyons, we saw desert gardens in full bloom (thanks to the rain!) and water-filled potholes with interesting aquatic organisms (see below pictures).

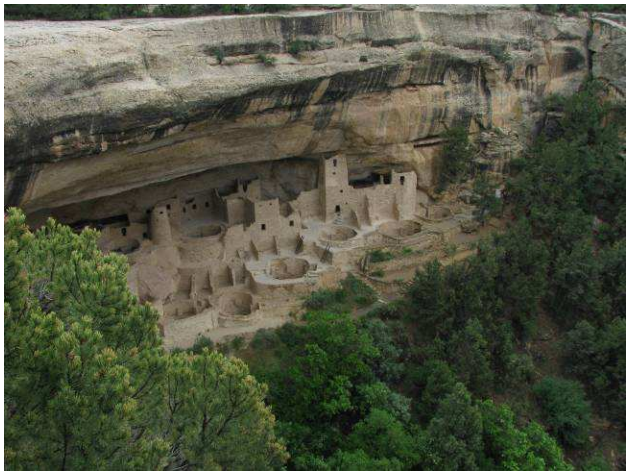




But most spectacularly, we discussed the formation of arches, which is largely dependent on joint formation, groundwater movement through the permeable sandstone, and physical and chemical weathering. Photographs of student walking through a natural bridge and group sitting below an arch.



Traveling towards Deadhorse Point State Park in Utah we started to really experience hydrology in action. To make a long story short, the area received half of their average annual precipitation in two back-to-back rainfall events. Yikes! One of us (Dr. Middleton) was not appreciative of the bad weather, while the other (Dr. Dolliver) was extremely excited to see the flash flooding and watch the erosional processes in action. It is difficult for our students to appreciate the power and importance of water even in the desert…we think they have it figured out now! The flash flooding and erosion was extremely intense…we even came across washed out highways (photographs of Colorado River and flash flooding below).

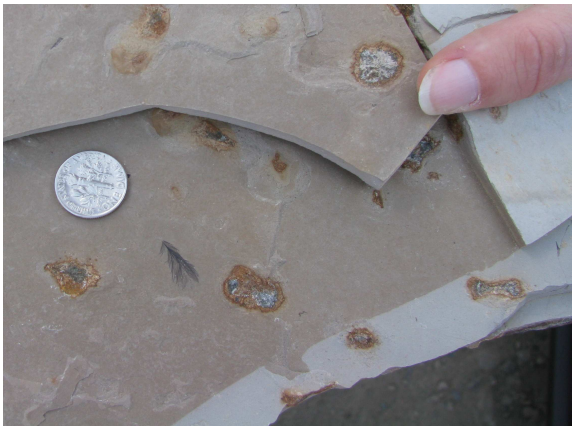


Our next destination was Mesa Verde National Park in Colorado. Here we learned about the importance of water for food production for the Anasazi. Our ranger discussed crop production techniques, specifically the three-sisters planting system, they used to conserve water. We also learned that a prolonged drought is believed to be one of the reasons the Anasazi both created and ultimately abandoned their cliff homes.

Back in the mountains, we stopped to observe braiding in a glacially-fed tributary of the Animas River near Silverton, Colorado. As we crossed over Wolf Creek Pass on our way to Great Sand Dunes National Park, we stopped to observe volcanic mudflows (lahars). The picture to the right shows nice fluvial stratification in the mudflow deposits.

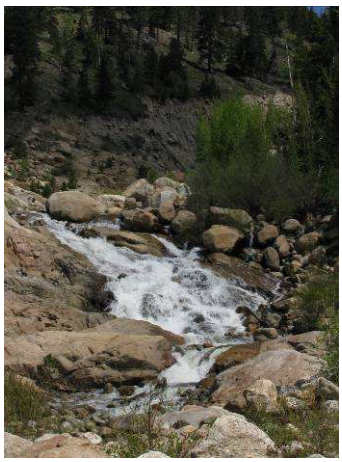
Located in the arid San Luis Valley, the Great Sand Dunes (tallest in North America!) are a result of complex interactions between wind and water processes. We were fortunate to observe surging flow and dynamic antidune formation in Medano Creek…some of the best we have ever seen! We discussed the importance of the creek as a source of sand from the mountains and as a recycler of sand from the valley. With the recent rains, hiking the sand was quite a bit easier…our whole group made it to the top of the tallest dune!

At Florissant National Monument west of Colorado Springs, we studied lake sedimentary environments dating back 45 million years. Earlier on the trip we studied the famous Green River Formation, which was deposited in a similar setting. We even collected a small fossil feather!



In the Front Range, we stopped to study more fluvial sedimentary rocks—the Fountain Formation (300 million years) and the Denver Formation (65 million years). One of our students led a discussion on the long history of environmental and groundwater contamination problems at the Rocky Flats Nuclear Weapons Facility near Boulder, Colorado.

The trip ended at Rocky Mountain National Park. Here the water stories focused on glaciers and flooding (fortunately we didn't have to experience these floods!). We traveled Trail Ridge Road to look at glacially carved valleys and deposits and experience a bit of the tundra ecosystem. We also hiked to a series of beautiful subalpine lakes in a glacial valley. In Horseshoe Park we discussed the Lawn Lake Flood of 1982, which heavily scoured the surrounding landscape (still visible today!) and deposited a large alluvial fan. We also discussed the Big Thompson Canyon Flood of 1976.



All in all it was a wonderful trip filled with a lot of learning and new experiences for our students. **We thank-you for your financial support for our trip and greatly appreciate your educational outreach efforts!**

Sincerely,

Dr. Mike Middleton
Dr. Holly Dolliver
Trip Participants

From left to right: Dr. Holly Dolliver, Marcus Mussey, Tom Bednarowski, Dr. Mike Middleton, Tessa Chatara-Middleton, Stephanie Marchiafava, Ashley Murray, Courtney Schlosser, Amy Smits, Chelsea Payne, Heather Sumner, Abby Cole, Brad Patrick, Ryan Peterson, Greg Flaatten, Amy Nachbor, Ryan Anderson, and Randy Crandell.