Soil Science on Vacation 4: Return to Alaska

Russell Losco, M.A., C.P.S.S.

In August of 2008, I was lucky enough to return to Alaska for two weeks along with my son and six friends. Because during my last trip to Alaska I had been forced to focus upon fishing (see "Soil Science on Vacation—North to Alaska," *Soil Survey Horizons*, Summer 2008, p. 41–43), I was determined to make the most of this trip to examine the soils and geology of the area in greater detail. Luckily, the group that I traveled with included a sanitarian and an engineer, both with soils and geology experience, a brother-in-law who has long tolerated my interests, and two 12-year-old boys blessed with innate curiosity. This was coupled with the fact that I was approaching graduation, working on a master's thesis deeply involved in periglacial processes, and studying under a professor who was willing to sponsor an independent study that would contribute one credit toward my degree. So it was that at the end of a long flight that included diverting to skirt several thunderstorms, I landed in Anchorage to begin a two-week trip to investigate the soils and geology of south-central Alaska.

Alaska is geologically and pedologically interesting for many reasons. Less than 1% of the land mass of Alaska was originally part of the North American continent. Alaska is a patchwork of terranes that have been accreted onto the craton. It is also the most tectonically active continental margin in this hemisphere. Earthquakes and volcanic eruptions are common in Alaska. Geologically, much of the area that I visited is a time capsule that mimics in many ways the area in which I work, which experienced similar tectonic activity in the Permian approximately 260 MA.

The first sight to greet us was a rainbow over Anchorage, surely a good omen. After obtaining our rental vehicles and some groceries, we set out at approximately 8:00 p.m. north toward Palmer, falling short of the now famous town of Wasilla, and turned eastward toward Glennallen. We hoped to make it the 120 miles to our lodgings in the Sheep Mountain area before dark. Dark begins around 11:00 at that time of year. Various delays, including road construction and moose crossings, slowed our progress such that we found ourselves driving up the Matanuska Valley after sunset, ultimately arriving at our destination well after midnight.

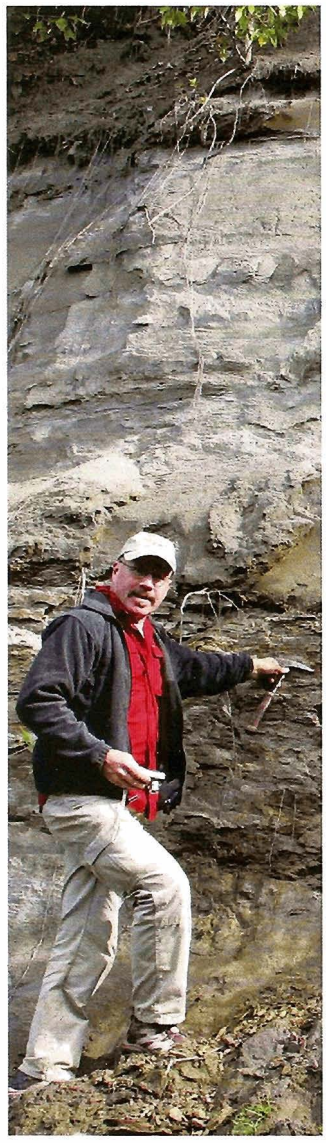
Russell Losco, M.A., C.P.S.S., Lanchester Soil Consultants Inc., Lanchester Soil Consultants Inc., 311 East Avondale Rd., West Grove, PA 19390 (soildude@comcast.net).
Published in Soil Surv. Horiz. 51:85–87 (2010).

The Matanuska Valley is located between the Talkeetna Mountains to the north and the Chugach Mountains to the south with the Matanuska River, a wide braided stream flowing westward in between. This is a tectonic collision zone, with the Chugach Terrane meeting the Wrangellia Composite Terrane at the Borders Range thrust fault, which is the Matanuska Valley. As we drove up this active thrust fault we were treated to a surreal experience, as the sun set to the northwest, bright light began to spill over the jagged Talkeetna Mountains to the north, lighting our way. We are used to seeing sunlight coming from the south, but here we drove through sunlight reflecting off of the polar icecap to the north, flowing eerily over the mountains and bathing us in a soft backlight that was bright enough to read by.

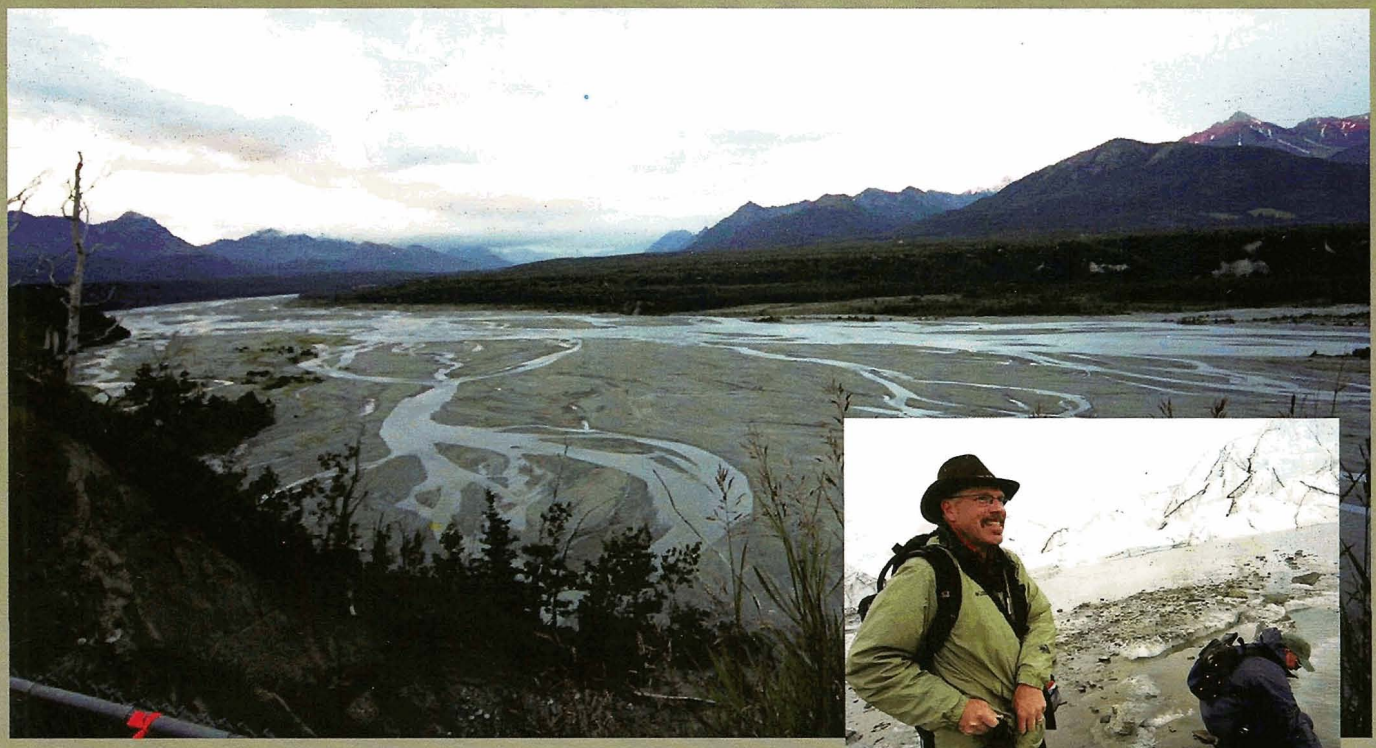
The Matanuska Valley is a spectacular area for anyone to visit, but for any Earth scientist, it is even more so. To stand on one spot and view a major glacier, a braided stream, two or three cirques, and an alluvial fan while at the same time standing upon soil underlain by permafrost is a rare experience for most of us. We had the opportunity to do this repeatedly.

When I traveled to Alaska in 2004 it was during their warmest summer on record. This time I landed there during the coldest summer on record. We experienced few days above 60°F and experienced snow flurries on the third day after we arrived. This turn of weather severely curtailed the soils investigations that I had planned to conduct, not because of comfort but because of safety concerns. With cool weather, the berry crop was late and sparse, and this coupled with a late and lighter than usual salmon run had led to a bear problem. Hungry bears were on the prowl, and bear attacks on humans were on a frequency that was significantly above average. Two people were mauled by bears within the city of Anchorage during the two weeks that we were in Alaska. A number of excursions that I had planned were cancelled on the advice of the locals. "I wouldn't go that far off of the road unless I was armed, and if I was armed I'd still hesitate to go there," was a phrase that I heard more than once.

Since I couldn't safely do the depth of soil exploration that I had hoped, I instead decided to focus on the breadth of the experience and spend more time on roadside geology and pedology. The aim of my independent study shifted to exploring and laying out the itinerary for a field course in geology and soils that my professor, Martin Helmke of West Chester University, plans to teach in the future. Luckily it appears to be



The author examining Andisols deposited by the Redoubt Volcano.



The Matanuska river, a braided stream.

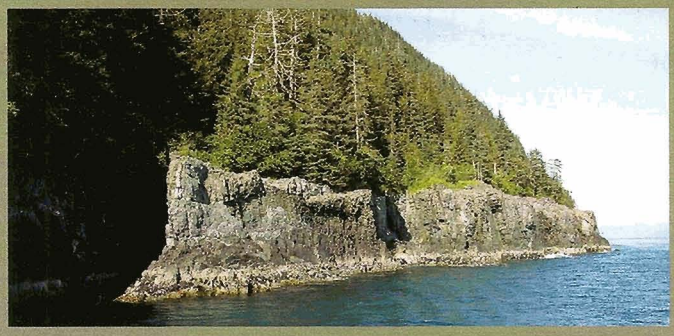
The author on the Matanuska Glacier.

possible to see more notable geology and soils in south-central Alaska in two weeks than one can see in the lower 48 states in a year.

There is only one road stretching the 140 miles from Palmer to Glennallen, with only two side dirt roads to turn off, so navigation is not complicated. An overlook west of Palmer affords an excellent view of the Matanuska River, which is a classic braided stream. This stretch of highway affords views of two major glaciers, the Matanuska and the Nelchina, as well as several cirques. Caribou Creek, which is a glacial stream that is tributary to the Matanuska River where recreational gold panning is sometimes done, crosses the Glennallen Highway between the Matanuska Glacier and Sheep Mountain. The water is a milky 5G5/6 from the sediment load, which is rich in serpentinite. From the parking area, no fewer than six normal faults, part of an imbricate fan, are visible in the bedrock exposure. A short distance west is Sheep Mountain with rich, multicolored gypsum outcroppings. Dall Sheep are drawn here by the gypsum, which they need to fuel the growth of their horns. Continuing westward, the mountains seem to fall away and the land opens up into stunted spruce forests underlain by discontinuous permafrost. Areas of "drunken" forest are readily visible where the permafrost is melting and the trees tilt at various angles. Near the road, which acts as a heat sink, trees tend to lean toward the road. Areas of the road are often wet in summer from melting permafrost seeping up through the pavement. Entering Glennallen, we came upon some construction work where a manhole was being installed and seized upon the opportunity to examine some soils, but were prevented by the workers from entering the excavation for insurance purposes. Still, we were able to glimpse gelisol profiles, if only from a distance.

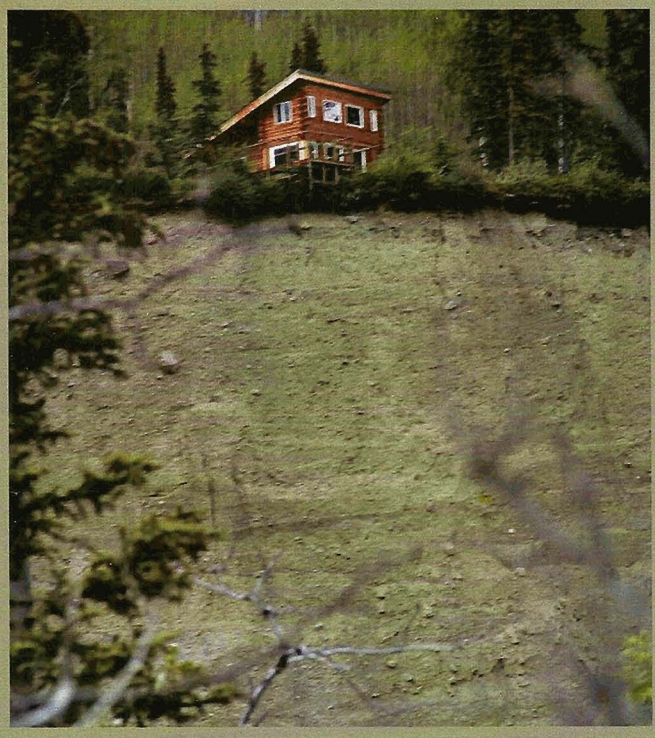
In Glennallen we turned south toward Valdez, passing by the Worthington Glacier and crossing the mountains at Thompson Pass. Then down through Keystone Canyon, a steep gorge through metamorphic slate punctuated by waterfalls. At the bottom of the canyon we entered into the glacial valley of Prince William Sound. Valdez Bay is a fjord, where water depths a short distance off shore plunge to more than 1200 feet. Old Valdez was built upon unconsolidated sediments on the edge of this abyss. When the unconsolidated sediments upon which the town was built sloughed off of the steep slope into the fjord, the town virtually disappeared in the 1964 earthquake. The remaining buildings that now are a part of the new town of Valdez were later relocated to their present location, on firm bedrock approximately 3 miles to the west. The area exhibits the steep U-shaped form of a glaciated valley, including tributary "hanging valleys" as well as distinct wave-cut terraces punctuating the mountainsides. These terraces appear to be due to periodic rapid tectonic uplift of the area just as happened in 1964 when portions of this area were uplifted more than 30 feet in less than a minute. A number of shorelines of Prince William Sound exhibit vertical cliffs at the water's edge that did not exist prior to the 1964 earthquake. Our three days in Valdez allowed us to visit both the Valdez Glacier, a mountain glacier, and the Columbia Glacier, a tidewater glacier. On the moraine of the Valdez Glacier, patterned ground was easily recognizable, and we had an opportunity to examine the poorly sorted fresh till and the now-familiar kettle and knob topography.

We left Valdez by ferry on the next leg of the journey, traveling west to the port of Whittier. The only land access to Whittier is through a 3-mile-long railroad tunnel. The tunnel is metered so that alternately the train can go through, then car traffic from north to south, followed by car traffic south to north, with delays in between to allow exhaust fumes to vent. More than one of our group expressed misgivings regarding driving slowly through a tunnel in the most tectonically active area in North and South American. Once through the tunnel we continued westward out onto the Kenai Peninsula.



Thirty-foot high escarpment uplifted during the 1964 earthquake in Prince William Sound.

The Nelchina Glacier.



The danger of building on unstable till in a tectonically active area.

On the Kenai Peninsula, we stayed at a group of cabins built upon the banks of the Kenai River at Cooper's Landing, coincidentally run by a husband and wife team of geologists who came to visit the area some years ago and could not stand to leave. Our time on the Kenai included a visit to the Exit Glacier. The Exit Glacier is an outgrowth of the Harding Ice Field, which is approximately 1500 square miles of ice, one of the last great remnants of the Laurentide Ice Sheet that once dominated North America. Like all of the other glaciers that we visited, the Exit Glacier is retreating headlong. The National Park Service has documented this movement and placed signs illustrating where the face of the glacier was on various dates, clearly illustrating the retreat of the glacier since 1815. It is difficult, if not impossible, to describe the feeling of standing at the face of a glacier, ankle-deep in meltwater, and trying to imagine that this is what my native Pennsylvania looked like 12,000 to 14,000 years ago.

Another day we made our way out the length of the Kenai Peninsula to the town of Homer. It is possible to view five active volcanoes along this route on the opposite side of Cook Inlet. We made a stop at Clam Gulch, a state park opposite the Redoubt Volcano. One of the few sand beaches in Alaska, it is littered with house-sized glacial erratics in the shadows of cliffs that are composed of exposures of layered Andisols inter-bedded with thin beds of lignite. The soil formation is limited due to the regular deposition of volcanic ash, as happened in March of 2009 when Redoubt erupted once more, blanketing the peninsula in ash once again. The town of Homer is situated on a spit at the tip of the peninsula. As you top the hill before descending into Homer, there is a noticeable drop in temperature because opposite the end of the peninsula is the western end of the Harding Ice Field.

As our time in Alaska grew short we took a day to try our hands at panning for gold. We traveled to Resurrection Creek, an area where recreational gold panning is allowed, downstream of a seasonal commercial gold extracting operation. I'm glad that I can say that I've tried panning for gold, but I must say that it is back-breaking work and the couple of suspect microscopic specks that we found were not worth the cost of a Ziploc bag to put them in. The day trip to pan for gold took us along the coast of the Turnagain Arm of the Cook Inlet. The Turnagain Arm was named by Lieutenant James Bligh, famous from the mutiny on the H.M.S. Bounty, which he commanded some years later. The young Bligh sailed as a junior officer with Captain Cook on one of his expeditions of exploration searching for, among other things, the fabled Northwest Passage. The name derived from the fact that while exploring it in search of the Northwest Passage, they had to "turn again" when they found it to be yet another dead-end. The Turnagain Arm is another fjord, but this one is choked with more than 1000 feet of rock flour from the glacial streams that feed into it. At low tide it looks like one could walk across it, though nobody has ever survived the attempt. The rock flour that fills the fjord has the consistency of runny pudding. This is coupled with the fact that the Turnagain Arm exhibits the second highest tidal bore in the world, second only to the Bay of Fundy in Nova Scotia. The tidal bore is large enough to surf on and enthusiasts often do so in the warmer periods of the summer. Several people have died from wading out into these mud flats and being unable to extricate themselves when the tidal bore rolls in.

Our time in Alaska seemed to pass in a heartbeat. Just as our circadian rhythms were becoming accustomed to the 18 hours of daylight, it was time to leave. Though I came away with a better understanding of the soils and geology of the areas that we visited, I was unable to do the depth of soils investigation that I had hoped for. Perhaps that means that I need to go back. I sure hope that's what it means.