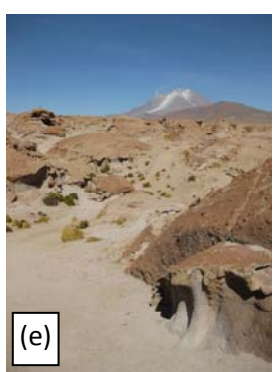
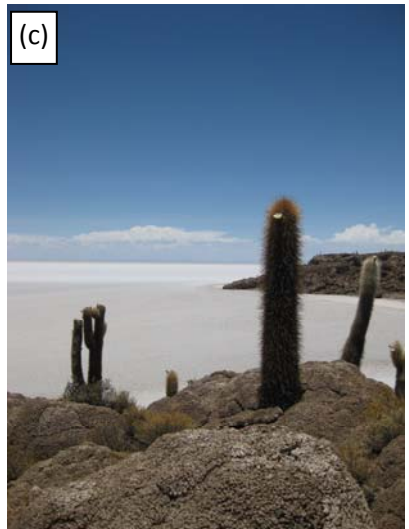


## Soils of Bolivia - "Suelos de Bolivia"

Bolivia is a geologist's wet dream, and as a soil scientist I was almost as excited. From the Andes Altiplano desert at the top of the world in the west, to the Amazon Jungle in the east, the diversity of landscapes and soil is amazing. During my six week stay in Bolivia, I found that there are three main ecoregions and each is more interesting than the next.

### Altiplano (3,500 to 5,200 metres ASL)

These high-altitude grasslands, located in the Andean high plateau, are called dry puna and extend through western Bolivia. The extremely cold and dry (6.2cm average annual rainfall in the far south-west) montane landscape is dominated by tussock grassland and interspersed with small alkaline wetlands, areas of bare soil and rocky outcroppings. It is beautiful, stark and a place of contrasting colours.



(a) A mountain copper vein (b) Laguna Colorado, borax, red algae and a llama (c) Isla Incahuasi & the Trichocereus cactus (d) 'Árbol de Piedra' or Stone Tree (e) Ollagüe Volcano (background) & sulfur mining (f) 'Salar de Uyuni' or Salt Flats

The main soils of the northern Altiplano are the well-drained glacial and upland soils (short grass cover and a dark-brown colour), but there is a wide variety of other soils ranging from the recent alluvial to claypan and hardpan soils (Storie, 1953). In the southern Altiplano, the volcanoes rise to greater than 6000m ASL and their highly colourful mineral slopes tower above the alluvial plains and the world's largest salt flats. The mountain soils are classed as Gray Desert Lithosols while the soils of the plains are alluvial (Storie, 1953). Numerous small lakes are dotted through the plains landscape. The fringes of the lakes have a waterlogged fibrous dark-brown organic soil which has developed over time, while the shorelines are also variously crusted with white deposits of sodium, magnesium, borax, arsenic and gypsum. The waters of the lakes are coloured from their mineral components, including the naturally high concentrations of lead, sulfur, arsenic, and calcium carbonates. Walking through the arsenic foam at the side of the lake was an unforgettable experience!

**Montanas-Valles** (700-3,700 metres ASL)

This ecoregion extends along the eastern slope of the Andes running north-south through central Bolivia. The terrain is mountainous with extreme ridges and valleys and an average annual rainfall of approximately 300cm. In the north, the semi-tropical climate and the steeply sloping terrain produce bananas, citrus fruits, avocados and coca shrubs. These soils are reddish brown, or yellowish brown in colour, with a silt loam, or silty clay loam texture and are low in N, P, K, and Ca (Storie, 1953).



(a)



(b)



(c)

(a) Dry creek bed erosion to the west of Sucre (b) Brick making operations along the riverbanks have contributed to deforestation & erosion (c) Local farmers cultivating rocky, dry fields by bullock

Further south into the semi-arid Cochambamba Valley and Cordillera de Los Frailes, the hill soils are shallow and the steep slopes combined with the local subsistence farming, has led to an extremely eroded landscape. In this area, we also saw a large number of eucalypt plantations, introduced to the indigenous farming community as a source of timber and slope stabilisation. Many of the locals complained that the eucalypts were a problem for their crops as they used the moisture and left none for their maize, barley, wheat and potato crops. Within the valleys, the soils are alluvial and distinct saline and alkali soils are found in these low, flatter lands (Storie, 1953).



Cerro Chataquila in Cordillera de Los Frailes

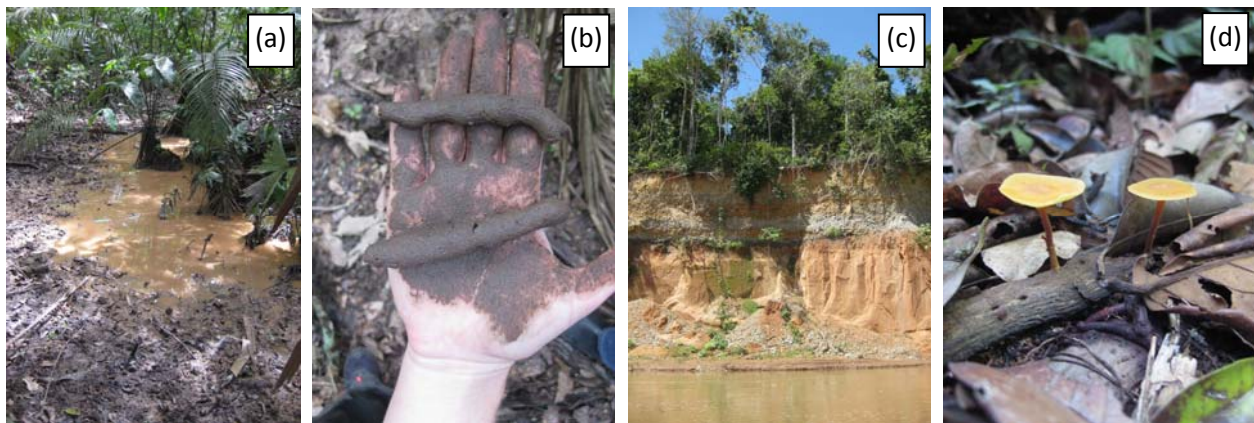
## Llanos (0-1,000 metres ASL)

These are the low eastern plains of Bolivia. These cover more than half of Bolivia and include the tropical rainforests, swamps and savannas of the Amazonian Basin. The monkeys, the birds, the forests – truly an amazing place!

In the extreme south, the climate is semiarid to subhumid tropical and broad alluvial fans of rivers flow out from the eastern Andes toward the Paraguay River. Although we didn't visit these areas, Mr Storie (1953) writes that a scrub forest grows in these sand, sandy loam, fine sandy loam or loam alluvial soils. Further north, in the vicinity of tropical Santa Cruz, there are broad, grassland areas growing in sandy alluvial soils are of recent origin and forests growing in a dark grayish-brown loam or clay loam.

The northern portion of the Llanos holds the broad alluvial plains where the rivers flow into the Amazon River. As the rivers flow out in the grassland areas, the soils are lateritic with a shallow dark surface horizon. However, the rainforest soils deposited by the river were moderately acidic and variable in color. They included a range of textures from sands to silty clays. Scattered throughout the jungle floor were isolated clay pans, noticeable by the surface water ponding. According to our local jungle guide, animals come to these clay pans to eat the clay to neutralize poisonous plants they've eaten.

Bolivia was an amazing country with incredibly friendly people and an amazing diversity of ecosystems. I would recommend it to everyone. Happy Travelling!



(a) Clay pan where animals gather to eat the clay (b) Soil texturing (c) River bank cutting and soil profile (d) Forest floor

### Article by Gillian Kopittke

Gillian is the current ASSSI (QLD) Treasurer and the QLD/NT Operations Manager at the OTEK Australia Pty Ltd. She has recently returned from a three month trip to South America, travelling through Argentina, Bolivia, Peru and Chile.



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