



Unusual Dark Soil Layers at Loch Vale

The Question: Does an unusual layer of dark soil influence nitrogen cycling in the Loch Vale watershed?

Human activities, including agricultural practices and burning of fossil fuels, have increased the amount of atmospheric nitrogen in rain and snow as it falls on ecosystems in the park. For more than 20 years at Loch Vale, scientists have been studying the ecological effects of increased nutrients to evaluate and predict the impact of this pollution. During studies of the Loch Vale Watershed in 2007, scientists found an unusual layer of dark soil in experimental plots, and they wondered, "Is this layer related to the cycling of nitrogen in the soil?"

The Project: Determine whether this dark soil layer plays a significant role in nitrogen cycling by analyzing its nitrogen content and distribution.

In 1996, US Geological Survey established three experimental plots in the Loch Vale watershed to evaluate long-term effects of nitrogen fertilization experiments. In 2007, Sabrina Kleinman, of Northern Arizona University and the Rocky Mountain Nature Association, collected soil cores both within and outside of the experimental plots to determine how similar the black soil layer was to surrounding soil horizons. Back at the lab, she measured nitrogen content of the dark soil layer and compared it with that of surrounding soil horizons. She conducted spatial analyses of soil samples to determine if the black soil layer may have been a product of the experimental fertilizing experiments or whether it occurred naturally.

The Results: It appears that the unusual black soil layer does not play any special role in nitrogen cycling in the Loch Vale watershed.

The dark soil layer did not have a nitrogen content significantly higher than adjacent soils in the A horizon, thus indicating that it was not a sink or accumulation area for nitrogen in the ecosystem. Spatial surveys discovered that this dark soil layer occurred widely and discontinuously between the A horizon (the soil layer nearest the surface) and B horizon (the next layer down) of well-developed forest soils. No correlation was found between the occurrence of the dark layer and nitrogen movement through the soils during the fertilization experiments. It was thus concluded that the soil layer played no unusual part in nitrogen cycling in this ecosystem. No ecological significance can be attributed to this unusual soil layer and it is most likely a well-developed organic-rich horizon (known as Bh to soil scientists) in the forested Lithic Cryoboralf soils of Loch Vale.



Top: Scientists wondered if this unusual dark soil layer influenced nitrogen cycling in the soil.

Bottom: Researcher Kleinman takes measurements and soil samples for testing.