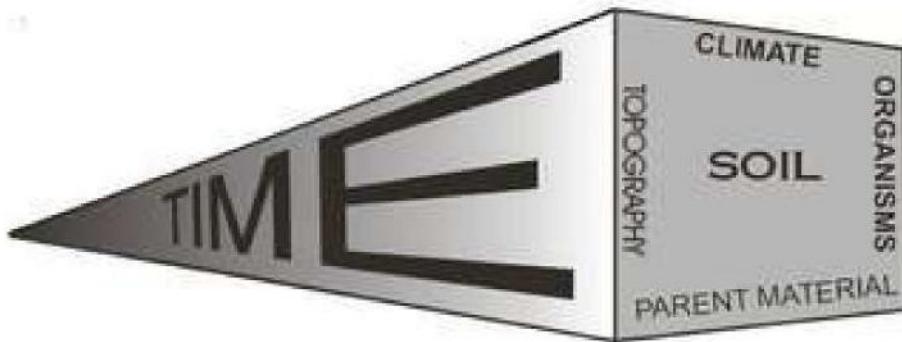


Soil Forming Factors



$$S = f(c, o, r, p, t)$$

Soil (S) formation is a function (f) of the five following factors:

Parent material (p) - Few soils weather directly from the underlying rocks. These “residual” soils have the same general chemistry as the original rocks. More commonly, soils form in materials that have moved in from elsewhere. Materials may have moved many miles or only a few feet. Windblown “loess” is common in the Midwest. It buries “glacial till” in many areas. Glacial till is material ground up and moved by a glacier. The material in which soils form is called “parent material.” In the lower part of the soils, these materials may be relatively unchanged from when they were deposited by moving water, ice, or wind.

Sediments along rivers have different textures, depending on whether the stream moves quickly or slowly. Fast-moving water leaves gravel, rocks, and sand. Slow-moving water and lakes leave fine textured material (clay and silt) when sediments in the water settle out.

Climate (cl) - Soils vary, depending on the climate. Temperature and moisture amounts cause different patterns of weathering and leaching. Wind redistributes sand and other particles especially in arid regions. The amount, intensity, timing, and kind of precipitation influence soil formation. Seasonal and daily changes in temperature affect moisture effectiveness, biological activity, rates of chemical reactions, and kinds of vegetation.

Topography/Relief (r) - Slope and aspect affect the moisture and temperature of soil. Steep slopes facing the sun are warmer, just like the south-facing side of a house. Steep soils may be eroded and lose their topsoil as they form. Thus, they may be thinner than the more nearly level soils that receive deposits from areas upslope. Deeper, darker colored soils may be expected on the lower land areas.

Biological factors/Organisms (o) - Plants, animals, micro-organisms, and humans affect soil formation. Animals and micro-organisms mix soils and form burrows and pores. Plant roots open channels in the soils. Different types of roots have different effects on soils. Grass roots are “fibrous” near the soil surface and easily decompose, adding organic matter. Taproots open pathways through dense layers. Micro-organisms affect chemical exchanges between roots and soil. Humans can mix the soil so extensively that the soil material is again considered parent material.

The native vegetation depends on climate, topography, and biological factors plus many soil factors such as soil density, depth, chemistry, temperature, and moisture. Leaves from plants fall to the surface and decompose on the soil. Organisms decompose these leaves and mix them with the upper part of the soil. Trees and shrubs have large roots that may grow to considerable depths.

Time (t) - Time for all these factors to interact with the soil is also a factor. Over time, soils exhibit features that reflect the other forming factors. Soil formation processes are continuous. Recently deposited material, such as the deposition from a flood, exhibits no features from soil development activities. The previous soil surface and underlying horizons become buried. The time clock resets for these soils. Terraces above the active floodplain, while genetically similar to the floodplain, are older land surfaces and exhibit more development features.

These soil forming factors continue to affect soils even on “stable” landscapes. Materials are deposited on their surface, and materials are blown or washed away from the surface. Additions, removals, and alterations are slow or rapid, depending on climate, landscape position, and biological activity.

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