

Soil Landscapes and Landforms

A landscape, in general terms, is the portion of the land surface that the eye can see in a single view. A landscape painting, for example, is an artist's representation of a landscape. More technically a landscape is a collection of landforms (Ruhe, 1969).

A landform is a physical feature on the Earth's surface that has a characteristic shape and was produced by natural causes (Ruhe, 1969).

A landscape is made of landforms.

In general usage, the term *hill* means an elevation of the land surface. *Hillslope* is a more technical term that refers to the portion of a hill from the top of a hill to the drainageway at the bottom of the hill.

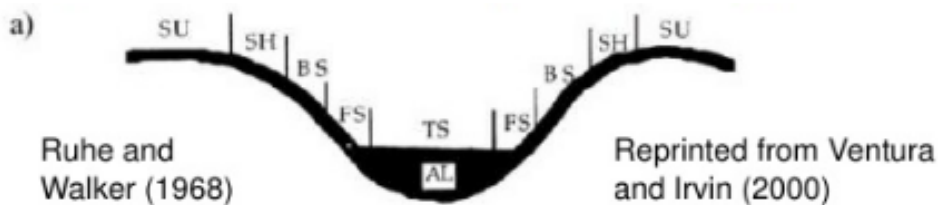
2 DIMENSIONAL LANDFORMS POSITIONS:

Hillslopes can be divided into specific components. This is a way of looking at the hill in 2-D.



FIGURE 2.2. Typical hillslope cross section illustrating landscape positions of summit, shoulder, backslope, footslope, and toeslope.

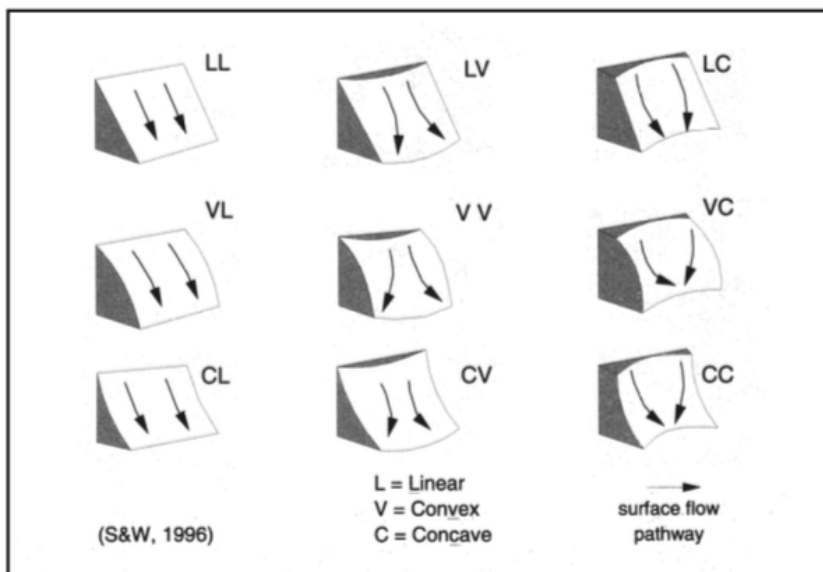
Although many landscapes are complex and irregular, there exist distinct and repeating patterns of hillslope elements that occur in most geomorphic settings. A typical hillslope profile (Fig. 2.2) can be segmented into summit, shoulder, backslope, footslope, and toeslope, landscape positions. The *summit* is the relatively flat area at the top of the slope. The *shoulder* is the steeply convex portion at the top of the slope. This surface shape favors the shedding of water and relatively drier soil conditions. The *backslope* is a linear portion of the slope that is not present in all hillslopes. At the bottom of the slope are the more concave *footslope* and *toeslope* positions, with the footslope being more steeply sloping than the toeslope.

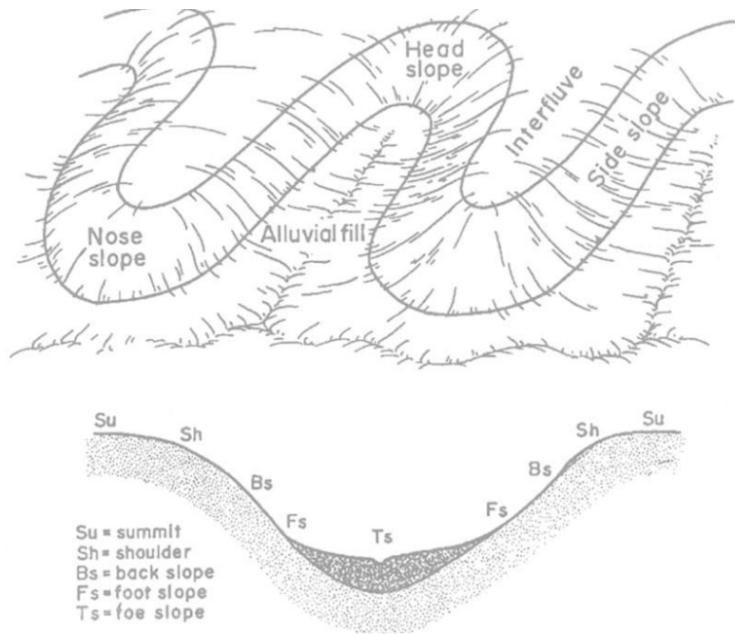


SU	Summit	An upland surface with an inclination which differs distinctly from the hillslope which ascends to it.
SH	Shoulder	The convex component between the summit and the backslope.
BS	Backslope	The typically linear, inclined part of the hillslope.
FS	Footslope	The concave part of the hillslope that welds the linear segments to lower terrain and is both an erosional and depositional surface.
TS	Toeslope	The region which extends away from the base of the hillslope and is composed of depositional debris.
AL	Alluvium	Unconsolidated depositional debris

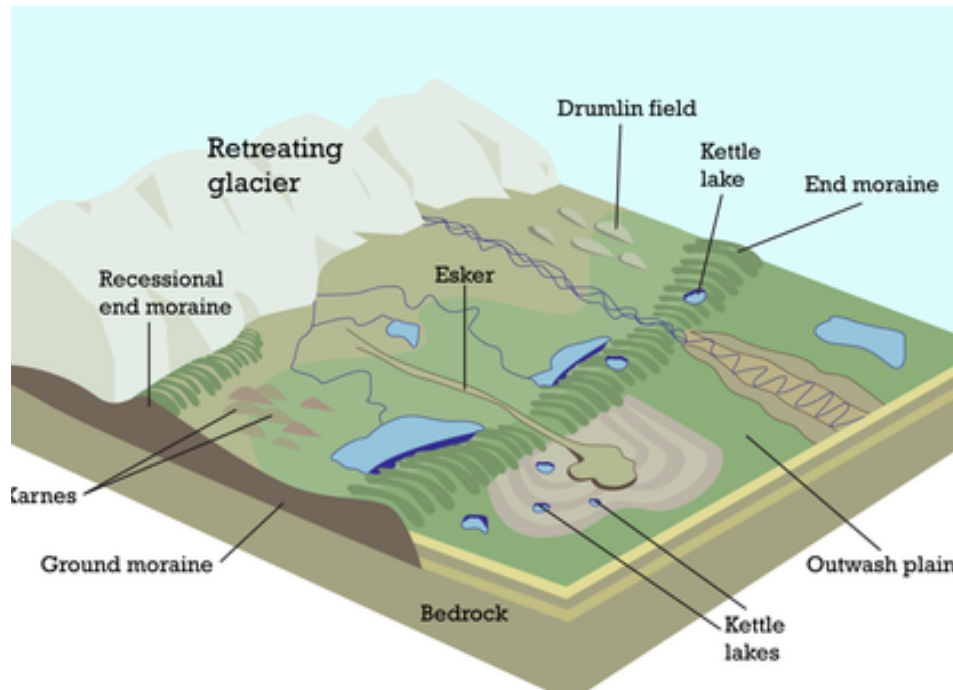
3-D LANDFORM POSITIONS: We also need to consider what a hillslope profile looks like in 3-D.

Figure 5. Geometric components of hillslopes. Slope shape is described in two directions: 1) slope profile or how the slope looks from the side (linear, convex, or concave) and 2) slope contour or how it looks from above, or the shape of contours on a topographic map (linear, convex, or concave). In the diagram, the pairs of letters refer to the two viewing points; for example, CV means that the slope is concave (C) in side view and convex (V) when viewed from above. (From *Handbook*, adapted from Ruhe, 1975).





Landforms and their origins:



Erosional landforms

As the glaciers expanded, due to their accumulating weight of **snow** and **ice**, they crush and **abrade** scoured surface **rocks** and **bedrock**. The resulting **erosional landforms** include **striations**, **cirques**, **glacial horns**, **arêtes**, **trim lines**, **U-shaped valleys**, **roches moutonnées**, **overdeepenings** and **hanging valleys**.

Depositional landforms

Later, when the glaciers retreated leaving behind their freight of crushed **rock**

and sand ([glacial drift](#)), they created characteristic **depositional landforms**. Examples include glacial [moraines](#), [eskers](#), and [kames](#). [Drumlins](#) and [ribbed moraines](#) are also landforms left behind by retreating glaciers. The stone walls of New England contain many [glacial erratics](#), rocks that were dragged by a glacier many miles from their [bedrock](#) origin.

- [Esker](#): Built up bed of a [subglacial stream](#).
- [Kame](#): Irregularly shaped mound.
- [Moraine](#): Feature can be terminal (at the end of a glacier), lateral (along the sides of a glacier), or medial (formed by the emerger of lateral moraines from contributory glaciers).

[Outwash fan](#): Braided stream flowing from the front end of a glacier.

* Drumlins and drumlin clusters are glacial landforms, composed primarily of glacial till and are low oval mounds or small hills, typically one of a group, consisting of compacted boulder clay molded by past glacial action. Geologists have proposed several [theories](#) about their origin. They can form both near the margin of glacial systems and within zones of fast flow deep within the ice sheet. They record the direction of ice movement at the time of formation.

Landform Vocabulary:

Head slope — A slope at the head of a small stream or drainageway, represented by concave contour lines and drainage lines that converge downward.

Nose slope — A slope at the end of a ridge, represented by convex contour lines and drainage lines that converge downward.

Side slope — A slope between a head slope and a nose slope, represented by straight contours and drainage lines.

Backslope — The straight and concave mid-portion of the hillslope. Some large backslopes may contain benches, scarps, or outcrops.

Bench — A long, narrow, relatively level or gently inclined surface cut into bedrock, bounded on one edge by a steeper descending slope and along the other edge by a steeper ascending slope.

Scarp — A very steep slope or cliff.

Outcrop — A part of the rock stratum that is exposed at the surface.

Crest — A convex surface at the top of a hill, or ridgetop; narrow tops of joined shoulders.

Drainageway — A course along which water moves in draining an area; narrow area of joined footslopes if cross section is U-shaped, or of joined backslopes if it is V-shaped.

Footslope — The gently sloping, slightly concave slope below the backslope.

Shoulder — Convex upper portion of the hillslope.

Summit — A broad, nearly level or gently sloping surface; when it is very large, it may be called a plain.

Toeslope — The lowest part of the hillslope formed on alluvium; when it is large, it may be called a floodplain.

Component descriptors used mainly with plain landforms

Depression — A slightly concave area in the midst of generally level land; an *open depression* has a natural outlet for surface drainage, and a *closed depression* has no natural outlet.

Flat — A general term for a level or nearly level surface marked by little or no relief; a surface with no apparent convexity or concavity. The term may be modified by adjectives that describe more specifically a location within the flat, such as the **interior** or **rim** of a flat.

Kettle — A depression in drift, made by the wasting away of a mass of glacier ice that had been wholly or partially buried in the drift.

Knoll — A small, low, convexly-rounded hill with slope $> 1\%$.

Pothole — A pot-shaped pit or hole, not over limestone, with no outlet; deeper and with steeper sidewalls than a depression. A pothole is usually smaller and tends to have more poorly drained soils than a kettle, but the two terms are not well differentiated.

Sinkhole — A depression, commonly funnel-shaped, over limestone, with underground drainage.

Swell — A well-rounded hill with slope $< 1\%$. **Component descriptors used with specific**

landforms, mainly flood plains

Backland — The lowland of a flood plain, between the natural levee and the base of a valley slope, that is not swampy or marshy.

Backswamp — Extensive marshy or swampy area of flood plains between a natural levee and the valley side.

Bog (See definition under landforms.) — A small bog may be considered to be a landform component, e.g. a component of a lake plain.

Channel — The bed where a stream flows, may flow, or has flowed. Usually used with flood plains.

Natural levee — A long, broad, low ridge or embankment of sediment, built by a stream on its flood plain along its channel. Natural levees are built during floods when water overflows the normal banks and deposits the coarsest part of its load.

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging. A slope at the head of a small stream or drainageway, represented by concave contour lines and drainage lines that converge downward.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.