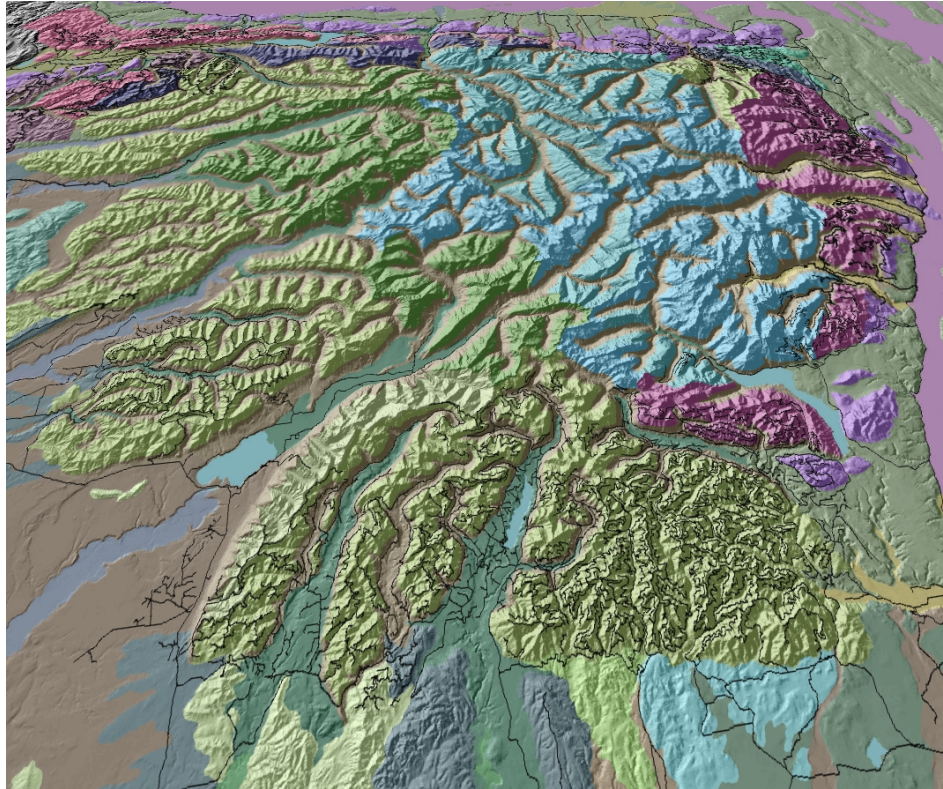


# Geomorphology of the Pacific Northwest

## Legend and Glossary

Definitions and Descriptions of Terms Used in the Mapping of Landforms, Landform Groups, and Landform Associations in Region Six, Forest Service



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**Note to the Reader**

This provisional, draft text presents and briefly describes the terms used in the preparation of a map of landform groups covering all forests within Region Six of the US Forest Service. Formal definition of map units is pending completion of this map and review thereof by all of the forests in Region Six. Map unit names appended to GIS shapefiles are concatenations of terms defined herein and are meant to be objective descriptors of the landscape within each map unit boundary. These map unit names have yet to undergo a final vetting and culling to reduce complexity, redundancy or obfuscation unintentionally resulting from map creation activities.

Any omissions or errors in this draft document are the responsibility of its authors.

Rev. 06 on 05December2013 by Jay Noller

## Geomorphology of the Pacific Northwest – Map Legend

Term	Description
Ancient Volcanoes	Landform groups suggestive of a deeply eroded volcano. Typically a central hypabyssal or shallow plutonic rocks are present in central (core) area of the relict volcano.
Apron	Footslope to toeslope positions of volcanoes to mountain ranges. Synonymous with bajada in an alluvial context.
Ballena	Distinctively round-topped, parallel to sub-parallel ridgelines and intervening valleys that have an overall fan-shaped or distributary drainage pattern. The ridge's broadly rounded shoulders meet from either side to form a narrow crest and merge smoothly with the concave backslopes. Locally applied to remnants of fan alluvium of the Great Basin (cf. Peterson, 1981) [FS Geomorph], but used as a landform <i>senso strictu</i> without reference to underlying lithology.
Canyon	Long, deep, relatively narrow steep-sided valley confined between lofty and precipitous walls in a plateau or mountainous area, often with a stream at the bottom; similar to, but larger than, a gorge. It is characteristic of arid or semiarid areas where stream downcutting greatly exceeds weathering (BJ 1995, FS Geomorph)
Canyonlands	Drainage characterized by a series of long, deep, relatively steep-sided valleys which generally occur within plateaus or mountainous country in arid or semiarid climates (FS Geomorph)
Cirque Basin	Deep, steep-walled half-bowl-like recess or hollow, variously described as horseshoe- or crescent-shaped or semicircular in plan, situated high on the side of a mountain and commonly at the head of a glacial valley, and produced by the erosive activity of a mountain glacier. It often contains a small round lake, and it may or may not be occupied by ice or snow.
Crater Wall	A crater is a basinlike, rimmed structure that is usually at the summit of a volcanic cone. It may be formed by collapse, by an explosive eruption, or by the gradual accumulation of pyroclastic material in a surrounding rim.
Cuesta	a hill or ridge with a gentle slope on one side and a steep slope on the other; specifically an asymmetric ridge with one face (dip slope) long and gentle and conforming with the dip of the resistant bed or beds that form it, and the opposite face (scarp slope) steep or even cliff-like and formed by the outcrop of the resistant rocks, the formation of the ridge being controlled by the differential erosion of the gently inclined strata (BJ 1995, FS Geomorph)
Delta	low, nearly flat, alluvial tract of land at or near the mouth of a river, commonly forming a triangular or fan-shaped plain of considerable area, crossed by many distributaries of the main river, perhaps extending beyond the general trend of the coast, and resulting from the accumulation of sediment supplied by the river in such quantities that it is not removed by tides, waves, and currents. Most deltas are partly subaerial and partly below water (BJ 1995, FS Geomorph)

## Geomorphology of the Pacific Northwest – Map Legend

Term	Description
Deposit	Earth material of any type, either consolidated or unconsolidated, that has accumulated by various mass wasting processes (BJ 1995, FS Geomorph)
Drift	An all-inclusive term for any kind of rock material transported and deposited by the ice or meltwater of glaciers (Tuttle)
Dune	A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand, sometimes volcanic ash), either bare or covered with vegetation, capable of movement from place to place but always retaining its characteristic shape. (BJ 1995, FS Geomorph)
Dune Field	An expanse covered by dunes (BJ 1995, FS Geomorph)
Escarpment	A long, more or less continuous cliff or relatively steep slope facing in one general direction, breaking the continuity of the land by separating two level or gently sloping surfaces, and produced by erosion or by faulting. The term is often used synonymously with scarp, although escarpment is more often applied to a cliff formed by differential erosion (BJ 1995, FS Geomorph)
Estuary	The seaward end or the widened funnel-shaped tidal mouth of a river valley where fresh water comes into contact with seawater and where tidal effects are evident; e.g. a tidal river, or a partially enclosed coastal body of water where the tide meets the current of a stream (BJ 1995, FS Geomorph)
Extended Terrain	Surface morphology preserving landforms including horsts, grabens, sags, shears, escarpments, diverted streams and other extensional tectonic landforms.
Fan	a gently sloping, fan-shaped mass of detritus forming a section of a low-angle cone commonly at a place where there is a noticeable decrease in gradient; specifically an alluvial fan
Flank (e.g. volcanic flank)	Lower third of a sideslope, below a slope break transition from steeper slope to more gradual slope
Flows	See Lava Flows
Foothills	A region of relatively low, rounded hills at the base of or fringing a mountain range (BJ 1995, FS Geomorph)
Gorge	A narrow deep valley with nearly vertical rocky walls, enclosed by mountains, smaller than a canyon, and more steep-sided than a ravine; especially a restricted steep-walled part of a canyon (BJ 1995, FS Geomorph)
Hanging Valley	A glacial valley whose mouth is at a relatively high level on the steep side of a larger glacial valley. The larger valley was eroded by a trunk glacier and the smaller one by a tributary glacier, and the discordance of level of their floors, as well as their difference in size, is due to the greater erosive power of the trunk glacier (BJ 1995, FS Geomorph)
Highlands	General term for a relatively large area of elevated or mountainous land standing prominently above adjacent low areas; a mountainous region. The term is often used in the plural in a

## Geomorphology of the Pacific Northwest – Map Legend

Term	Description
	proper name. BJ 1995, FS Geomorph)
Hills	**See Meybeck definition below
Hillslopes	Slopes of hills.
Ice Cap	A mass of ice and snow that permanently covers a large area of land, i.e. a mountain range (relict feature) (smaller than an ice sheet)
Ice Cap Borderlands	Areas neighboring the Ice Cap Margin, but not directly impacted by the Ice Cap itself; internal landforms may reflect the presence of the Ice Cap.
Ice Cap Highlands	Areas once covered by an Ice Cap and that now topographically stand in higher relief than surrounding deglaciated area.
Ice Cap Margin	Sculpted by ice and deposition of drift and loess along the maximum extent boundary of a mountain ice cap.
Ice Cap Moraine	Glacial till deposited in a ridge-like landform (moraine) parallel to the ice cap margin.
Ice Cap Plain	Sculpted by ice and inwash deposition within the 'footprint' of a mountain ice cap.
Ice Cap Slopes and Valleys	Landforms sculpted by ice within the 'footprint' of a mountain ice cap; including meltwater canyons or coulees.
Icefields	Areas of ice accumulation showing nivation landforms, but lacking classic glacial landforms.
Ice Sheet Margin	Sculpted by ice and deposition of drift and loess along the maximum extent boundary of a continental ice sheet.
Ice Sheet Uplands	Area immediately adjacent to and influenced by a large mass of glacier ice, e.g. a continental glacier (larger than an ice cap)
Intermountain	Areas between mountains.
Interplain Valleys	Valleys that cross-cut plains, such as volcanic plains, due perhaps to erosional and/or tectonic processes.
Inwash Plain	A broad, gently sloping sheet of inwash deposited by meltwater sourced from stagnant glacial ice, the surface of a broad body of inwash.
Landslides	Mass movement deposits and landforms with rotational to translational styles of slope failure.
Lava Flows	A lateral, surficial outpouring of molten lava from a vent or a fissure; also, the solidified body of rock that is so formed
Lowland	**See Meybeck definition below
Maar	A low-relief, broad volcanic crater formed by multiple shallow explosive eruptions. It is surrounded by a crater ring, and may be filled by water
Marine Platform	An actively forming landform group with similar forms (esp. sand dunes, marine/estuarine sediment deposits, seacliff) and internal characteristics of marine terraces; the lowest marine terrace.

## Geomorphology of the Pacific Northwest – Map Legend

Term	Description
Marine Terrace	A narrow, gently sloping constructional coastal strip extending seaward or lakeward, and veneered by a sedimentary deposit; esp. a wave-built terrace. Or, a stripped wave-cut platform that has been exposed by uplift or lowering of the water level; an elevated wave-cut bench. (BJ 1995, FS Geomorph)
Meander Belt	A deep to very deeply incised meander plain; similar landforms to a meander plain except most are greatly exaggerated in relief and underlain by bedrock.
Meander Plain	The zone along a valley floor across which a meandering stream shifts its channel from time to time, specifically the area of the flood plain included between two lines drawn tangentially to the the extreme limits of all fully developed meanders. It may be from 15 to 18 times the width of the stream (BJ 1995, FS Geomorph)
Meltwater canyons/coulees	Landforms sculpted by glaciofluvial process in subglacial and epiglacial locations. Typically recognized as valleys with underfit streams or windgaps across watershed divides.
Midlands	Landscape intermediate to lowlands and uplands.
Moraine	A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice, in a variety of topographic landforms that are independent of control by the surface on which the drift lies.
Mountain	**See Meybeck definition below
Mountainfront	Pronounced mountain slope or set of planar to somewhat planar slopes facing a plain or other area of lower elevation and low relief.
Mountain Valley	Valley within and oriented parallel to the crest of a mountain range, such as a crestal chasm or graben.
Mountainside	Slopes of mountainous area, extending from below the summit to a lower position.
Outwash Plain	A broad, gently sloping sheet of outwash deposited by meltwater streams flowing in front of or beyond a glacier, and formed by coalescing outwash fans; the surface of a broad body of outwash (BJ 1995, FS Geomorph)
Peat Lowlands	Area of low topographical relief with internal drainage and high water table or surface water evident. of peat or muck accumulation is known or likelihood is high.
Piedmont	Lying or formed at the base of a mountain or mountain range; e.g. a piedmont terrace or a piedmont pediment. An area, plain, slope, glacier, or other feature at the base of a mountain; e.g. a foothill or a bajada. (BJ 1995, FS Geomorph)
Plain	**See Meybeck definition below
Plateau	**See Meybeck definition below
Platform	**See Meybeck definition below
Pumice Fan	Fan-shaped deposit of water-transported pumice, occurring at the base of a topographic feature where there is a slope break

## Geomorphology of the Pacific Northwest – Map Legend

Term	Description
Pumice Plain	Area of low relief and low roughness (see Meybeck definition below) blanketed with a substantial thickness of pumice from a local vent source
Scours	The powerful and concentrated clearing and digging action of flowing air, water, or ice, esp. the downward erosion by stream water in sweeping away mud and silt on the outside curve of a bend, or during time of flood.
Scours and Deposits	A process of alternate excavation and refilling of a channel, as by a stream or the tides; especially such a process occurring in time of flood, when the discharge and velocity of an aggrading stream are suddenly increased, causing the digging of the new channels that become filled with sediment when the flood subsides.
Shield Crest	Crestal area of a shield volcano, comprising peak and shoulder.
Shield Volcano	volcano in the shape of a flattened dome, broad and low, built by flows of very fluid basaltic laval and/or pyroclastic flows (modified BJ 1995, FS Geomorph)
Tablelands	General term for a broad, elevated region with a nearly level or undulating surface of considerable extent; or, a plateau bordered by abrupt clifflike edges rising sharply from the surrounding lowland; a mesa. (BJ 1995, FS Geomorph)
Terrace	A step-like surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake or sea shore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper descending slope (scarp, riser) graded to a lower base level of erosion.
Uplands	A general term for high land or an extensive region of high land, especially far from the coast or in the interior of a country. The higher ground of a region, in contrast with a valley, plain, or other low-lying land (BJ 1995, FS Geomorph)
Valley	Any low-lying land bordered by higher ground; an elongate, relatively large, gently sloping depression of the Earth's surface, commonly situated between two mountains or between ranges of hills or mountains, and often containing a stream with an outlet. It is usually developed by stream erosion, but may be formed by faulting. A broad area of generally flat land extending inland for a considerable distance, drained or watered by a large river and it's tributaries. (BJ 1995, FS Geomorph)
Valley Bottoms	The comparatively broad, flat bottom of a valley; it may be excavated and represent the level of a former erosion cycle, or it may be buried under a thin cover of alluvium.
Volcano	A conical hill of lava and/or pyroclastics that is built up around a volcanic vent (BJ 1995, FS Geomorph)
Volcano Mountains	region characterized by mountains of volcanic origin, which are any part of the earth's crust higher than a hill, sufficiently elevated above the surrounding land surface of which it forms a part to be

## Geomorphology of the Pacific Northwest – Map Legend

Term	Description
	worthy of a distinctive name, characterized by a restricted summit area (as distinguished from a plateau), and generally having comparatively steep sides and considerable bare-rock surface of volcanic origin (BJ 1995, FS Geomorph)

### Meybeck Mountain Model

The following terms are defined based on the Meybeck mountain model, which uses degree of surface roughness and mean elevation to develop a standardized global classification (Meybeck, M., P. Green and C. Vorosmarty. 2001. A New Typology for Mountains and Other Relief Classes: An application to Global Continental Water Resources and Population Distribution. Mountain Research and Development, 21(1): 34-45). Roughness and maximum altitude are described at a resolution of 30 x 30'. Relief Roughness (RR) = max minus minimum elevation per cell divided by half the cell length in meters/kilometer.

Hill (Meybeck)	All rough terrains ( $20 < RR < 160$ ) at low altitude (200-500 mean elevation)
Lowland (Meybeck)	Restricted to maximum mean elevations $< 200$ m; very similar to plains but have a relatively greater roughness due to minor or moderate valley incisions
Mountain (Meybeck)	Defined by mean elevation, exceeding 500 m, roughness exceeds 20 at low and medium altitudes (500-2000 m) and 40 at high and very high altitudes (2000-4000 m and 4000-6000 m)
Plain	Defined primarily by subhorizontal relief
Plateau	Low or medium roughness; low plateaus are very flat terrain while high plateaus may be poorly dissected (Meybeck). Any comparatively flat area of great extent and elevation; specifically an extensive land region considerably elevated (more than 150-300 m in altitude) above the adjacent country or above sea level; it is commonly limited on at least one side by an abrupt descent, has a flat or nearly smooth surface but is often dissected by deep valleys and surmounted by high hills or mountains, and has a large part of its total surface at or near the summit level. A plateau is usually higher and has more noticeable relief than a plain (it often represents an elevated plain), and is usually higher and more extensive than a mesa; it may be tectonic, residual, or volcanic in origin (BJ 1995, FS Geomorph)
Platform	Defined by intermediate altitude (200-500 m, higher than plains) and intermediate roughness (5-20). Can be considered very low altitude plateaus.



## Landform Groups of the Pacific Northwest - Structural Pattern Qualifiers

Term	Description
Broad	Surface more pronounced in areal extent than relief.
Broadcrested	Weakly defined ridgeline bordered by low- to moderately-sloping shoulders.
Craggy	Rough, rugged elevated surface full of crags.
Dissected	Having a high relief roughness, mainly resulting from stream systems crossing the landscape, resulting in a repeating "V-like" plan view of ridges and valleys.
Faceted	Having flat faces with sharp angular boundaries between faces, indicative of competent, crystalline bedrock
Incised	Streams are entrenched in the surrounding landform and not necessarily connected to a floodplain. The landform may have a low surface roughness and likely lacks the "V-like" plan view common with dissected landforms
Radial	Radiating drainage diverges away from a central high point, typically on a conical feature such as a volcano
Reticulated	Area dominated by obvious joint trellis, rectangular or angular drainage pattern.
Rugose	Surface full of wrinkles with sunken drainages. Drainage sideslopes are planar concave.
Sharpcrested	Well-defined ridgeline bordered by recognizable shoulders and or backslopes.
Shattered	Area with drainage pattern characterized as greatly randomized and angulate.
Sinusoidal	Having sinuous shaped groups of landforms or outer map boundary.
Smooth	Planar surface with minor to no discernable landforms resolvable at original scale of mapping.
Smoothcrested	Undefined ridgeline bordered by low-sloping shoulders; low relief, convexo-planar surface underlies drainage divide.
Smoothtop	Broad, low-sloping to flat crestal areas of ridges.
Stratal	Megalandforms resulting from corrasion of tilted geological strata, showing landforms (flatirons, triangular facets, dipslopes) indicative of individual beds to formations. Synonyms: cuestaform and structurally controlled slopes.
Sulcate	Surface with longitudinal furrows, crests are smoothly convex and swales are v-shaped. Drainage sideslopes are planar convex.
Terraced	Having repeating landform patterns of treads and risers
Verrucated	Surfaces covered by warty or lumpy elevations. The warts or lumps ('knockers' in California's Franciscan Terrane) are resolvable at the scale at which the landform map is produced. Has some similar interpretations as 'hummocky,' which is reserved for areas of known landsliding.
Washboard	Regularly spaced drainages and ridges with mirror symmetry of depths and heights, respectively; analogous to a laundry washboard of old.

## Landform Groups of the Pacific Northwest - Geomorph Process Qualifier

Term	Description
Ashmantled	Blanketed with substantial thickness (>18 inches) of ash-sized particles (finer than 0.1 inch) from local vent sources
Ashy	Blanketed with thin (< 18 inches) of ash-sized particles (finer than 0.1 inch) from local vent sources
Collapsed	Indicative of large-area landslides/mass wasting, slump and source can be identified; drainage patterns may be interrupted
Eroded	Worn away by running water, waves, moving ice, or wind (deflation or abrasion), or by such processes as mass wasting and corrosion (Bloom, 1991, FS Geomorph)
Faulted	Area of fracturing and displacement where two rock masses have slid past each other
Fluvial	Of or pertaining to streams; produced by stream or river action
Fluviolacustrine	Material transported, sorted and deposited by flowing streams into lake systems, where further sorting may occur
Glacial	Pertaining to distinctive processes and features produced by or derived from glaciers and ice sheets, as in glacial lakes or glacial erosion (BJ 1995, FS Geomorph);
Glacialscored	Area of bare rock resulting from the abrasive action of rock fragments embedded in the base of a moving glacier (my own definition)
Glaciated	Pertaining to a formerly glacier-covered surface, especially one that has been modified by the action of a glacier or an ice sheet
Glaciofluvial	Stratified material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. (NRCS Glossary, HP)
Glaciolacustrine	Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes by water originating mainly from the melting of glacial ice. Many are bedded or laminated with varves or rhythmites.
Glaciovulcanic	Deposits and/or landforms derived from mixed sources of glacial and volcanic, including ash-on-ice sourced deposits and subglacial eruptive vents and flows.
Hummocky	Uneven, irregular or undulating ground surface with many small hills and swales; may be indicative of deep-seated rotational soil movement but not necessarily so (my definition)
Ice Margin	Sculpted by ice and deposition of drift and loess along the maximum extent boundary of a Mountain Ice Cap or Continental Ice Sheet.
Lacustrine	Pertaining to, produced by, or formed in a lake or lakes.
Megaflow Scoured	Soil and unconsolidated geologic sediments removed/swept away by Missoula Floods floodwaters
Outwash Scoured	Area scoured of soil and unconsolidated geologic sediments by glacial meltwaters and locally accumulative of drift, particularly stratified outwash.

## **Landform Groups of the Pacific Northwest - Geomorph Process Qualifier**

<b>Term</b>	<b>Description</b>
Paraglacial	Influenced/directly conditioned by glaciation and deglaciation, though the area is not in direct contact with glacial ice or influenced by cold-climate processes as with periglacial landscapes; features are constructed by geomorphic processes active during the transition from glacial to post-glacial conditions (my definition)
Periglacial	Pertaining to processes, conditions, areas, climates, and topographic features occurring at the immediate margins of glaciers and ice sheets, and influenced by cold temperature of the ice.
Pumiced	Covered with pumice, rock fragments > 2 mm in diameter, made of light-colored, vesicular, glassy rock commonly having the composition of rhyolite. The material commonly has a specific gravity of <1.0 and is thereby sufficiently buoyant to float on water.
Volcanic	Referring to the processes by which magma and its associated gases rise into the crust and are extruded onto the Earth's surface and into the atmosphere; the structures rocks and landforms produced.
Volcanofluvial	Deposits and/or landforms derived from mixed fluvial and volcanic processes, including mudflow deposits.

## Geomorphology of the Pacific Northwest – Morphometry Qualifiers

The following are morphometry parameters, definitions and valid values used in the USFS classification, with some additions and modifications.

**Slope Shape** - Refers to the shape (horizontal and/or vertical) of the land surface

Value	Meaning
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CV	Concave (also depression)
CX	Convex (also raised)
L	Linear/Planar (also straight, even, smooth)
P	Patterned - relief of hummocks and swales within several feet)
U	Undulating (also rolling) - pattern of one or more low relief ridges or knolls and draws
B	Broken - cliffs, knobs, and/or benches interspersed with steeper slopes - generally characterized by sharp, irregular breaks
X	Mixed

**Ground Surface Shape** - Shape of the ground surface (as opposed to the land surface). May be further described according to the type of features causing the shape by a term from the microfeature table.

Value	Meaning
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C	Collapsed
E	Eroded
F	Faulted
H	Hummocky
U	Uniform

**Dissection Frequency Class** - The frequency class for dissections in landforms with slope components.

Value	Meaning (at 1:100,000 scale)
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U	Undissected (0 channels/mile)
S	Slightly Dissected (1-2 channels/mile)
M	Moderately Dissected (2-5)
H	Highly Dissected (>5 channels/mile)

**Dissection Depth Class** - The dissection depth class for landforms with slope components.

Value	Meaning
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S	Shallowly incised
I	Incised
D	Deeply incised (aka Deep)
V	Very deeply incised (aka Ultradeep)
R	Rugged - Having two or more dissection depth classes

## Geomorphology of the Pacific Northwest – Morphometry Qualifiers

**Drainage Pattern** - The configuration or arrangement in plan view of the natural stream courses in an area.

Value	Meaning
DN	Dendritic - Type pattern resembles spreading oak or chestnut tree
DNDS	Subdendritic - minor secondary control
DNPN	Pinnate - A dendritic drainage pattern in which the main stream receives many closely spaced, subparallel tributaries that join it at acute angles, resembling in plan a feather; it is believed to indicate unusually steep slopes on which the tributaries developed. Found in fine-textured, easily erodible materials.
DNAS	Anastamotic - Pertaining to a network of branching and rejoining channel pattern of a braided stream. Found on floodplains, deltas and tidal marshes.
DNDS	Distributary - A divergent stream flowing away from the main stream and not returning to it, as in a delta or on an alluvial fan. It may be produced by stream deposition choking the original channel
PR	Parallel - A drainage pattern in which the streams and their tributaries are regularly spaced and flow parallel or subparallel to one another over a considerable area. It is indicative of a region having a pronounced, moderate to steep uniform slope and a homogeneous lithology and rock structure. Also found in areas with parallel, elongate landforms.
PRSP	Subparallel - Found on intermediate slopes or controlled by subparallel landforms.
PRCO	Colinear - Occur between linear landforms, such as those observed in eroded loess plains and sand ridges.
TR	Trellis - A drainage pattern characterized by parallel main streams intersected at or nearly at right angles by their tributaries, which in turn are fed by elongated secondary tributaries parallel to the main streams, resembling in plan the stems of a vine on a trellis. It is commonly developed where the beveled edges of alternating hard and soft rocks outcrop in parallel belts, as in a rejuvenated folded-mountain region or in a maturely dissected belted coastal plain of tilted strata; it is indicative of marked structural control emphasized by subsequent and secondary consequent streams.
TRST	Subtrellis - Parallel elongate landforms.
TRDT	Directional Trellis - Occurs on gentle homoclines or gentle slopes with beach ridges or other linear, apparently accretionary landforms.
TRRT	Recurved Trellis - Occurs on plunging folds.
TRJT	Joint Trellis - Occurs in areas having straight parallel faults or joints or other type lithological contacts.
RC	Rectangular - A drainage pattern in which the main streams and their tributaries display many right-angle bends and exhibit sections of approximately the same length; it is indicative of streams following prominent fault or joint systems that break the rocks into rectangular blocks. It is more irregular than the trellis drainage pattern, as the side streams are not perfectly parallel and not necessarily as conspicuously elongated, and secondary tributaries need not be present.
RCAN	Angulate - Occurs in areas having joints and faults at other than a right angle.
RD	Radial - A drainage pattern in which consequent streams radiate or diverge outward, like the spokes of a wheel, from a high central area; it is best developed on the slopes of a young, unbreached domal structure or of a volcanic cone.
RDCN	Centripetal - Occurs in craters, calderas and other depressions.

## Geomorphology of the Pacific Northwest – Morphometry Qualifiers

AN	Annular - A drainage pattern in which subsequent streams follow a roughly circular or concentric path along a belt of weak rocks, resembling in plan a ring-like pattern. It is best displayed by streams draining a maturely dissected structural dome or basin where erosion has exposed rimming sedimentary strata of greatly varying degrees of hardness.
MB	Multibasinal - Drainage pattern expressed in areas having hummocky surficial deposits, differentially scoured or deflated bedrock, areas of recent volcanism, limestone solution or permafrost where there is a multiple depression pattern.
MBGD	Glacially Disturbed - Glacial erosion or deposition.
MBKS	Karst - Limestone or other lithology prone to dissolution and mass collapse due to solutional erosion of mass.
MBTK	Thermokarst - Permafrost
MBEB	Elongate Bay - Coastal plains and deltas.
CT	Contorted - A pattern lacking regional orderliness, discontinuity of ridges and valleys and generally smaller scale.

### Topographical Modifier

#### Value    Meaning

H	High - Land surface is pronouncedly higher in elevation than neighboring area or other land surfaces of similar class.
L	Low - Land surface is relatively lower in relief than neighboring area or other landform groups of similar class.
D	Deep - Land surface is obviously deeper in relief than neighboring area or other landform groups of similar class.
U	Ultradeep - Land surface is pronouncedly deeper in relief than neighboring area or other landform groups of similar class.

### Surficial Processes (PROC1 [=Surficial Process #1], PROC2, PROC3; Sp1 [=Surficial Process #1], Sp2)

Code	Initial	Surficial Process
0	W	Active water bodies; rivers, lakes and ocean.
1	E	Eolian
2	F	Fluvial
3	G	Glacial
4	L	Lacustrine
5	O	Marine (Ocean)
6	M	Mass wasting, including colluvium
7	T	Tectonic or strata (Geological structure)
8	V	Volcanic
9	X	Mixed

## Geomorphology of the Pacific Northwest – Morphometry Qualifiers

### Construction Modifier (LfA\_CON [Landform Assoc. construction], LfG\_CON [Landform Group const.])

Value	Meaning
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- |    |   |
|----|---|
| 3  | Geologically recent construction of landform is evident. Fresh landforms indicative of new construction of land surface by deposition of sediments, tephra or other materials. Minor erosion, such as active river channels, may be included in this class. Original landform(s) (inferred) is/are well preserved in much of the landform map unit. |
| 2  | Same as value 3, except freshness or new construction are inevident or weathering and degradation of landform has occurred. Original landform(s) (inferred) is/are moderately preserved in much of the landform map unit.   |
| 1  | Same as value 2, except it is evident that weathering and degradation of landform has occurred. Original landform(s) (inferred) is/are poorly preserved in much of the landform map unit.   |
| 0  | Nothing remains of the original constructional or erosional surface. Original landform(s) (inferred) is/are not preserved in any part of the landform map unit.   |
| -1 | Same as value -2, except it is evident that weathering and aggradation on landform has occurred. Original landform(s) (inferred) is/are poorly preserved in much of the landform map unit.  |
| -2 | Same as value -3, except freshness or new destruction are inevident or weathering and aggradation on landform has occurred. Original landform(s) (inferred) is/are moderately preserved in much of the landform map unit.   |
| -3 | Geologically recent erosion of landform is evident. Fresh landforms indicative of new erosion of land surface by scouring of sediments, rock or other materials. Minor deposition, such as active river floodplain, may be included in this class. Original landform(s) (inferred) is/are well preserved in much of the landform map unit.          |

## **Geomorphology of the Pacific Northwest – Morphometry Qualifiers**

Provisional 'Global' Key to Raster/Grid Map of Landforms in the Area of the Willamette NF

These have yet to be locally reclassified to more specific landform names.

Draft Summer 2011 Jay Noller, Oregon State University

Based on Weiss Landform Model (for ArcView)

### **Landforms Dominantly Related to Fluvial Erosion or Deposition**

- 1 CANYONS and DEEPLY INCISED STREAMS (Fluvial deposits, local rockfall deposits where walls have toppled or collapsed)
- 2 MIDSLOPE DRAINAGES and SHALLOW VALLEYS (Fluvial deposits predominant)
- 3 UPLAND DRAINAGES and HEADWATERS (Fluvio-colluvial deposits predominant)

### **Landforms Dominantly Related to Glaciation**

- 4 U-SHAPED VALLEYS (Glacial deposits and landforms predominant; includes valley bottoms, valley mid-slopes and lower glacial trough walls)

### **Landforms of Multiple *Potential* Origins**

- 5 PLAINS
- 6 OPEN HILL SLOPES
- 7 UPPER HILL SLOPES and MESAS
- 8 LOCAL RIDGES and HILLS IN VALLEYS
- 9 MIDSLOPE RIDGES and SMALL HILLS IN PLAINS
- 10 PEAKS, MOUNTAIN TOPS, and HIGH RIDGES



# Geomorphology of the Pacific Northwest

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