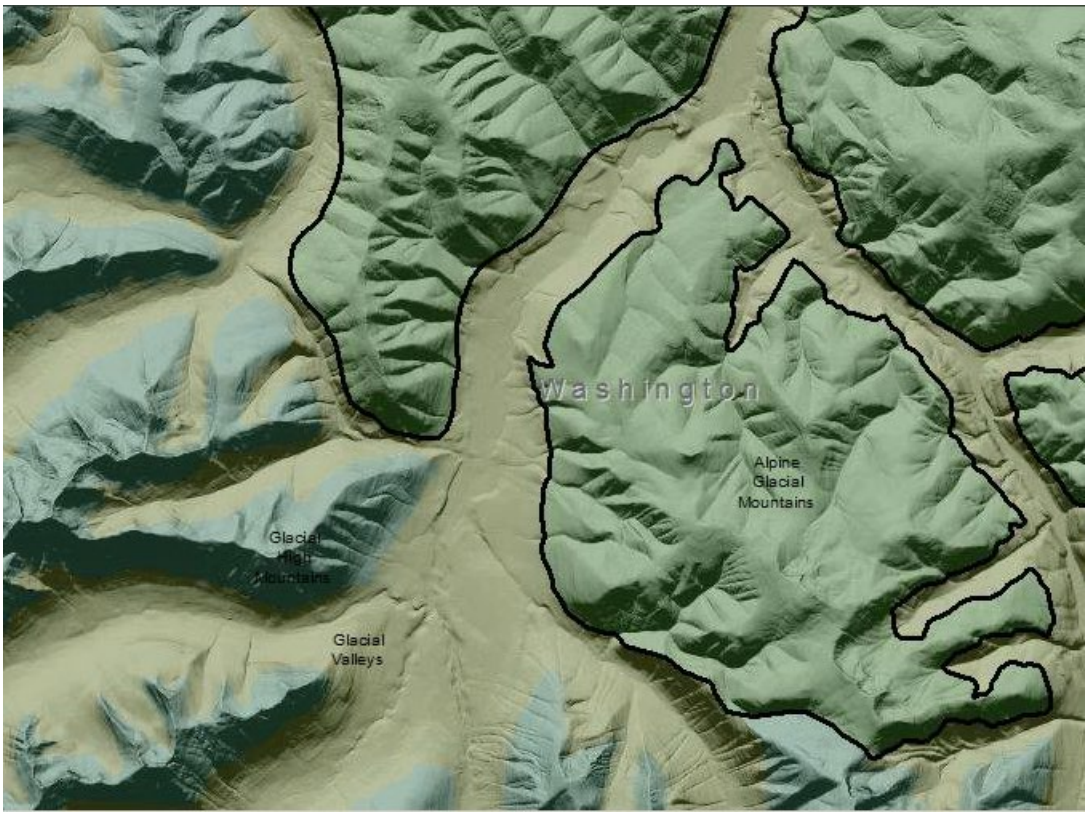
North Cascades Alpine Glacial Mountains

Terrain Class: Mountains - No one process responsible for construction of mountains. They can be uplifted, tectonic, subduction of plates, folding, uplift, up and down warping of the mantle, inflation of molten lower crustal (batholiths), etc. Erosion of mountain systems occurs over time. The rate of erosion is dependent on the geomorphic process, the underlying rock structure, and the climate, including both freeze thaw and the amount and intensity of precipitation and runoff. Mountains are further defined and distinguished based on morphology, including the pattern and density of drainages, depth of drainages, overall morphology of the area between the drainages, evidence of a strong imprint of a surficial process such as glaciation, and presence of visible underlying rock structure.

Mountains have simple to very complex forms that have arisen due to inherited rock structure, rock history, and are the net result of local to regional spatial scales of competing rates of upbuilding/uplift and downgrading/erosion. Mountains will have an inherited history from weathering and degradation of the underlying stack of earth materials that forms them. Vegetation, habitat, water interception, collection and transport will share a similar history in the same type of uplift and rock.

Landform Association: Alpine Glacial Mountains



Alpine Glacial Mountains are the mountaintops that were above the maximal depth level but within the area covered by the Cordilleran Continental Icesheet. The terrain was carved by alpine glaciers is

glacially scoured, with hanging valleys, large U-shaped valleys, with vertical to near-vertical slopes and bedrock common throughout.

Soils range from shallow soils to rock or exposed rock. In many locations ice has cleared out all sediment. Water routing across this Landform Association is chiefly sheetwash that is slope dependent, with common ponds and lakes in low-lying areas. Shallow glacial soils are droughty even in rainy areas. What keeps them from drying out is replenishment from precipitation. These landscapes are most vulnerable to climate change. With a reduction in precipitation the glacial soils behave like ones in arid climates.

This Landform Association has a limited spatial extent on National Forest System Lands.

Landtype Associations: Landtype Associations are formed by intersecting vegetation series or groups of vegetation series with Landform Associations.

Topography:
The following tables represent the average conditions for the Landform Association. Only lands within and adjacent to National Forest System Lands were mapped by this project. The entire EPA Level III Ecoregion is not covered by this mapping.

The percent of Landform Association (% of LfA) in bold in the table below refers to the percent of the Ecoregion represented by that Landform Association. The (% of LfA) numbers not in bold in the table below refer to the percent of each Landtype Association within the Landform Association.

Landform Association/Landtype Association	**% of LfA**	**Mean % Slope**	**Minimum Elevation (m)**	**Maximum Elevation (m)**	**Mean Elevation (m)**	**% Northerly Aspect (226° - 134°)**	**% Southerly Aspect (135° - 225°)**
Alpine Glacial Mountains	**2.3%**	**49**	**1690**	**2189**	**1968**	**72%**	**28%**
Alpine Glacial Mountains, Alpine	1.8%	61	2195	2521	2366	78%	22%
Alpine Glacial Mountains, Alpine - Parkland	1.0%	61	1915	2483	2264	78%	22%
Alpine Glacial Mountains, Douglas-Fir	9.4%	50	1110	1720	1410	66%	34%
Alpine Glacial Mountains, Douglas-Fir - Subalpine Fir	0.2%	57	1329	1797	1618	91%	9%
Alpine Glacial Mountains, Parkland	44.6%	45	1829	2338	2117	79%	21%
Alpine Glacial Mountains, Parkland - Alpine	1.0%	64	1942	2456	2245	86%	14%
Alpine Glacial Mountains, Parkland - Rock	0.3%	68	2086	2517	2289	79%	21%
Alpine Glacial Mountains, Parkland - Subalpine Fir	1.2%	48	1794	2278	2059	75%	25%
Alpine Glacial Mountains, Rock	0.6%	61	2038	2473	2283	87%	13%
Alpine Glacial Mountains, Rock - Alpine	0.5%	47	2170	2503	2364	81%	19%
Alpine Glacial Mountains, Rock - Parkland	0.3%	74	2063	2645	2308	76%	24%
Alpine Glacial Mountains, Subalpine Fir	39.0%	44	1567	2068	1854	65%	35%

Climate:

Landtype Assocation	Mean Annual Precipitation (mm)	Mean Annual Temperature °C	AET/PET Ratio July, Aug, Sept
Alpine Glacial Mountains	**1041**	**2**	**0.24**
Alpine Glacial Mountains, Alpine	1448	0	0.21
Alpine Glacial Mountains, Alpine - Parkland	1156	1	0.17
Alpine Glacial Mountains, Douglas-Fir	729	4	0.29
Alpine Glacial Mountains, Douglas-Fir - Subalpine Fir	550	4	0.20
Alpine Glacial Mountains, Parkland	1101	1	0.22
Alpine Glacial Mountains, Parkland - Alpine	1417	1	0.21
Alpine Glacial Mountains, Parkland - Rock	1213	0	0.21
Alpine Glacial Mountains, Parkland - Subalpine Fir	1273	2	0.22
Alpine Glacial Mountains, Rock	1503	0	0.19
Alpine Glacial Mountains, Rock - Alpine	891	0	0.18
Alpine Glacial Mountains, Rock - Parkland	1437	0	0.18
Alpine Glacial Mountains, Subalpine Fir	937	3	0.26

The ratio of Actual Evapotranspiration to Potential Evapotranspiration (AET/PET) is used as a broad-scale indicator of potential drought stress. We obtained modeled actual and potential evapotranspiration datasets from the Numerical Terradynamic Simulation Group at the University of Montana (http://www.ntsg.umt.edu/project/mod16) for a 30 year climate average. AET/PET ratio in the table above is based on a scale of zero to one. A value closer to 1 means the vegetation is transpiring close to its potential. A value farther from 1means that the Actual Evapotranspiration is below potential based on this climatic zone (Ringo, et. al. 2016 in draft).