Map Unit Properties Table: Haleakalā National Park

Rows shaded in gray indicate units not mapped within Haleakalā National Park, but included in the digital geologic data for the park.

Age	Map Unit (Symbol)	Geologic Description	Geologic Issues	Geologic Features and Processes	Geologic History and Park Connections
QUATERNARY (Holocene)	Fill (Qf) Beach deposits (Qbd) Younger dune deposits (Qdy)	**Qf** contains manmade fill such as concrete forming piers and breakwaters at coastline harbors. **Qbd** contains reworked sand and gravel along the coastline in parallel strand-line deposits. Sand is mostly calcareous and cream-colored with some detrital black volcanic sands and rarer sandstone (from beach rock). **Qdy** includes mostly coralline sand in eolian sheets and small-scale dunes usually found adjacent to **Qbd** in coastal areas. Unit is as much as 15 m (50 ft) thick. **Qbd** is mapped within the park.	High to low erosion resistance for unconsolidated units. During seismic events, units may be prone to liquefaction near coastal areas. Low-lying, coastal areas may be prone to inundation during tsunamis.	Shell fragments exist in this unit. Units are associated with coastal areas and would have provided early Hawaiians with fishing areas and temporary campsites. Sand (including "black sand"), gravel Nearshore habitats for shellfish and other marine life associated with these units.	In concert, units display shoreline dynamics and anthropogenic attempts to control the natural environment. **Qdy** is testament to prevailing winds.
QUATERNARY (Holocene)	Landslide deposits (Qls) Talus and colluvium (Qtc)	**Qls** contains blocks of lava flows and scant soils that form a mantle at the base of steep valley walls and sea cliffs. **Qtc** is poorly consolidated to unconsolidated silt, sand, and larger blocks in poorly-sorted jumbles mantling slopes locally. **Qtc** often forms sheet or wedge-shaped deposits at the base of bedrock cliffs. **Qtc** is mapped within the park.	Low erosion resistance. Units are unsuitable for most infrastructure due to poor sorting, instability, and dynamic setting. Units are associated with hazardous steep bedrock exposures and cliffs. Units are prone to further movement and failure. Low-lying, coastal areas may be prone to inundation during tsunamis.	Units may contain modern organic remains. Units may contain early Hawaiian artifacts. Sand, soil, lava blocks Unit provides porous areas for burrows and nests.	Units record continual erosion and weathering of Maui.
QUATERNARY (Holocene and Pleistocene)	Alluvium (Qa)	**Qa** contains unconsolidated silt, sand, and gravel along waterways and in valley bottoms. Locally this unit grades into talus and colluvium.	Low erosion resistance. Unit is associated with active riverine processes and may be prone to flash floods and erosion after precipitation events. Low-lying, coastal areas may be prone to inundation during tsunamis.	Unit may contain modern organic remains. Units associated with surface freshwater resources that would have been vital to early Hawaiian civilization. Silt, sand, gravel, cobbles Riparian habitat	**Qa** and **QToa** record the geologic evolution and history of local drainages

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QUATERNARY (Holocene and Pleistocene)	Hāna Volcanics: lava flows (Qhn0, Qhn1, Qhn2, Qhn3, Qhn4, Qhn5, Qhn6) vent deposits (Qhnv0, Qhnv1, Qhnv2, Qhnv2b, Qhnv3, Qhnv4, Qhnv5, Qhnv6) tephra deposits (Qhnt) intrusive rocks (Qhni) explosion crater deposits (Qhne)	Lava flows are mostly aphyric with some slightly to highly porphyritic rocks common locally. Flows are predominantly ʻaʻā with some minor pāhoehoe. Units are divided on the basis of age from youngest **Qhn6** to oldest **Qhn0**. Vent deposits (**Qhnv**) include scoria and spatter in cinder cones. **Qhnt** includes fallout tephra, with coarse- to fine-grained lapilli, ash, and crystals, with some eolian reworking with distance from the source vent. Some beds are reworked by slope wash, and range in thickness from 5 cm to 10 m (2 in. to 33 ft). **Qhni** is typically eroded and poorly exposed with coarser-grained textures. **Qhne** contains mantling gray, lithic lapilli and coarse ash fall. Unit may have formed by heating of perched water as volcanism proceeded at vents to the west and east. Lava flows (**Qhn**), vent deposits (**Qhnv**), tephra deposits (**Qhnt**), and intrusive rocks (**Qhmi**) are mapped within the park.	Moderate to low erosion resistance for unconsolidated ash and tephra deposits. Units are relatively unweathered and may prove unstable for foundation bases. Summit areas should be avoided for most infrastructure due to fragile environment. Unit is associated with relatively recent volcanic activity and could be unstable on steep slopes. Unconsolidated deposits could be at risk for landslides or rockfall. Low-lying, coastal areas may be prone to inundation during tsunamis.	Avian fossils in some lava tubes. Potential paleontological resources of additional animals that lived in or were transported into lava tubes and caves. Unit forms much of the modern surface of the summit areas of Haleakalā Volcano and may have spiritual relevance to native Hawaiians. Olivine, clinopyroxene, plagioclase phenocrysts (1 cm [0.5 in.]), ash High elevation habitat for silverswords, greenswords, kupaoa, and fauna such as uau, petrels, wolf spiders, forest birds, honeycreepers, Maui parrot bills, and various insects.	Units are radiometrically age dated with the oldest emplacements at 120,000 years ago. Units record the geologic history and evolution of Haleakalā Volcano.
QUATERNARY (Pleistocene)	Kaupō Mud Flow: (Qkamd) Kaupō Mud Flow conglomerate (Qkamc)	**Qkamd** contains deposits of breccia, including large clasts (>3 m [10 ft]) in a poorly sorted, lithic sandy matrix. **Qkamc** is interbedded with **Qkamd** as sparse roundstone conglomeratic strata.	Moderate erosion resistance. Units should be avoided for most infrastructure due to nature of formation and setting. Units are associated with debris flows and could potentially pose a landslide hazard. Low-lying, coastal areas may be prone to inundation during tsunamis.	No fossil resources documented for this unit. Unit may have entrained artifacts. Boulders, cobbles, sand, conglomerate	**Qkamd** is older than 120,000 years (based on a dated overlying lava flow). Units record the geologic history and evolution of Haleakalā Volcano.
QUATERNARY (Pleistocene)	Kula Volcanics: lava flows (Qkul) lava flows; ankaramite of Summit House (Qkuls) lava flows; Kumuʻiliahi member (Qkuk) vent deposits (Qkuv) intrusive plugs (Qkui)	**Qkul** lava flows are mostly ʻaʻā with some minor pāhoehoe with aphyric to porphyritic textures and compositions of hawaiite, mugearite and rare trachyte with upper units becoming more alkalic with some basanite locally. **Qkuls** is highly porphyritic ʻaʻā lava flows. **Qkuk** is alkalic pāhoehoe lava near the volcanic summit exposed in the crater walls. **Qkuv** contains scoria and spatter in cinder cones and spatter ramparts locally. **Qkui** is mostly dikes and scant stocks (western summit area) with similar mineralogy to **Qkul**.	Moderate erosion resistance. Summit areas should be avoided for most infrastructure due to fragile environment. Units may be associated with rockfall and unstable surfaces when exposed on steep slopes. Low-lying, coastal areas may be prone to inundation during tsunamis.	No fossil resources documented for this unit. Unit forms part of the modern surface of the summit areas of Haleakalā Volcano and may have spiritual relevance to native Hawaiians. Lava rocks, cinders, ash, olivine High elevation habitat for silverswords, greenswords, kupaoa, and fauna such as uau, petrels, wolf spiders, forest birds, honeycreepers, Maui parrot bills, and various insects.	**Qkuls** is exposed near the Summit Visitor Center, and may be the youngest unit on the western flank with an age of 214,000 ± 20,000 years. **Qkui** may be the source areas for **Qkul**. Units record the geologic history and evolution of Haleakalā Volcano.

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QUATERNARY (Pleistocene)	Honomanū Basalt (Qmnl)	Unit consists of pāhoehoe and ʻaʻā lava flows as high as 900 m (2,950 ft) in altitude above the north and northeastern coastal areas. Unit is mostly reversed-polarity magnetization.	Moderately high erosion resistance. Steeply-sloped coastal areas should be avoided due to risk of slope failure and inundation. Steeper areas are prone to rockfall and debris flows. Coastal areas are prone to flooding. Low-lying, coastal areas may be prone to inundation during tsunamis.	No fossil resources documented for this unit. Unit may contain remains of coastal settlements of ancient Hawaiians. Lava rocks Coastal, tropical habitats	Unit is reversed-polarity and thus a useful age-dating source. Units record the geologic history and evolution of Haleakalā Volcano.
	Older dune deposits (Qdo)	**Qdo** contains lithified calcareous beach sand or eolianite that occur in dune fields inland of the present coastline. Sands are usually cream-colored and calcareous with some caliche and red paleosols present locally. Strongly lithified units contain eolian limestone cemented by calcite. Extensive stretches of this unit mantle the isthmus between East and West Maui reaching 10–12 m (33–39 ft) in thickness.	Moderately low erosion resistance. Units are suitable for most infrastructure unless undercut or exposed on steep slopes. Hazards associated with units include slumping and sliding. Low-lying, coastal areas may be prone to inundation during tsunamis.	Shells, bird bones Units may contain evidence of early settlers. Sand, limestone, caliche, paleosols Varied lowland habitats	**Mantles the isthmus between Haleakalā Volcano and West Maui Volcano.** Contains organic remains that can yield radiocarbon and argon age dates to better delineate the geomorphological history of Maui.
	Lahaina Volcanics: lava flows (Qlhl) vent deposits (Qlhv)	Units both have basanitic composition and aphyric textures. **Qlhl** contains thick ʻaʻā flows. **Qlhv** includes cinders, spatters, and bombs in irregular deposits.	Moderate to moderately low erosion resistance for unconsolidated deposits. Units are suitable for most infrastructure unless unconsolidated. Steeper areas are prone to rockfall. Low-lying, coastal areas may be prone to inundation during tsunamis.	No fossil resources documented for this unit. Units may contain ancient Hawaiian campsites and other artifacts. Cinders, ash, lava rocks Varied temperate habitats	Units erupted from four vents, two of which were active 600,000 years ago, the other two about 400,000 years ago. Units record the geologic history and evolution of the West Maui Volcano.
	Honolua Volcanics: lava flows (Qul); bulbous dome of massive lava (Qud) cinder spatter (Quv) dikes (Qui)	Units are mostly benmoreite with some lesser trachyte as thick as 230 m (755 ft) with an average thickness of 20 m (66 ft). **Qul** is ʻaʻā lava flows with some columnar jointing in the central areas. Thickness of lava flows ranges from 7–90 m (23 –295 ft) with maximum thickness of 150 m (492 ft). **Qud** contains bulbous masses of lava with some intrusive features. Some domes display concentric jointing. **Quv** contain bedded cinder deposits, which may surround and underlie **Qud**. **Qui** are intrusive lavas with widths ranging from 2.5 to 8 m (8.2 to 26 ft).	Moderate to moderately high erosion resistance for intrusive rocks. Avoid unconsolidated layers for heavy infrastructure. Units can be prone to rockfall if undercut or exposed on steep slopes. Heterogeneous nature of units may render them unstable. Low-lying, coastal areas may be prone to inundation during tsunamis.	No fossil resources documented for this unit. Units may contain ancient Hawaiian sites. Lava rocks, ash Varied semi-tropical to temperate habitats	Units record the geologic history and evolution of the West Maui Volcano.

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QUATERNARY (Pleistocene-Pliocene?)	Wailuku Basalt: lava flows (QTwl) vent deposits (QTwv) tuff (QTwt) pit crater (QTwpc) lava cone (QTwlc) phreatic explosive debris (QTwp) dike complex (QTwdc) caldera complex (QTwcc) intrusive rocks (QTwi)	Units comprise the main mass of the West Maui Volcano. Compositions are mostly tholeiitic basalt with some alkalic basalt and minor hawaiite present locally. **QTwl** contains thin pāhoehoe and ʻaʻā lava flows. **QTwv** includes scoria and spatter present in cinder cones. **QTwt** is present in thin beds interlayered with lava flows, generally close to rift zones. **QTwpc** includes lava flows, breccia, talus, and slope wash formed along rift zones. Flows are unconformable with **QTwl**. **QTwlc** contains many very thinly-bedded lava flows in close proximity to the source vent. **QTwp** includes thin beds of lithic breccia with basalt lava blocks in a gray comminuted matrix associated with near summit volcanism. **QTwdc** is closely spaced dike accumulations. Dikes are generally less than 1 m (3 ft) wide. **QTwcc** contains interlayered and poorly-defined cemented vent breccia, lava flows, indurated talus deposits, and some pyroclastic deposits.	Moderately high to moderate erosion resistance. Units are suitable for most infrastructure unless unconsolidated or undercut on steep slopes. Hazards associated with these units include landslides, rockfall, and slumping. Low-lying, coastal areas may be prone to inundation during tsunamis.	No fossil resources documented for this unit. Units form much of West Maui. Ash, pāhoehoe lava, breccia Units host semi-arid to semi-tropical habitats.	Radiometric ages range from 2 to 1.3 million years for these units. Units record the geologic history and evolution of the West Maui Volcano.
QUATERNARY (Pleistocene-Pliocene)	Older alluvium (QTao)	Unit contains relatively consolidated sand and gravel, sometimes referred to as conglomerate. Grains are typically well rounded and sorted with some minor poorly sorted colluvial depositional layers. Typically forms terrace deposits and thick valley mantles now being incised by modern streams.	Moderately low erosion resistance. Unit is suitable for most infrastructure unless undercut in narrow valleys or highly porous. Unit is associated with terrace deposits and sometimes with steep valley slopes that may be prone to landslides and rockfalls. Low-lying, coastal areas may be prone to inundation during tsunamis.	Unit may contain organic remains. Unit is associated with surficial freshwater resources vital to early Hawaiian life. Conglomerate Riparian habitat	**Qa** and **QToa** record the geologic evolution and history of local drainages.