Map Unit Properties Table: Crater Lake National Park

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Age	GRI GIS Map Unit (Symbol) *GIS data online and on CD*	Simplified Geologic Map Unit (Symbol) *poster in pocket*	Source Map	Geologic Description	Geologic Issues, Features, and Processes	Geologic History
QUATERNARY (Holocene)	Alluvium (Hal)	Alluvial deposits (Qal)	Bacon (2008)	Unconsolidated water-transported mud, sand, gravel, and coarser debris deposited in or adjacent to present-day streams.	Mount Mazama—typically contains a large fraction of material reworked from deposits of climactic eruption of Mount Mazama, 7,700 years ago.	The fluvial history, as represented by **Qal**, is secondary to the volcanic history of the park. **Qal** mapped in two areas: northwest and southeast of Crater Lake caldera.
	Sediment gravity-flow deposits (Hsl)	Slope movements (Qsm)	Bacon (2008)	Clastic sediment in the three primary basins and in depressions on and between lava flows and landslide deposits on the floor of Crater Lake. Maximum thicknesses 75 m (250 ft) in east basin and <50 m (160 ft) in the southwest and northwest basins. Uppermost layers consist of mud and fine-grained sand thought to have been deposited by sheet-flow turbidity currents.	Slope Movements—modern deposits, primarily on the floor of Crater Lake caldera. Crater Lake Caldera and Fill—represent modern, ongoing sedimentation.	Postcaldera Basin Filling.
	Landslide deposits (Hls)		Bacon (2008)	Landslide and debris-avalanche deposits, mainly beneath the surface of Crater Lake. Composed of unconsolidated, poorly sorted, typically heterolithologic debris derived from the caldera walls and transported into the lake by slope movements. Debris-avalanche deposits have hummocky surfaces and contain lithic blocks as large as many tens of meters across in a matrix that may contain a range of particle sizes from clay to boulders. Largest debris-avalanche deposit, below Chaski Bay, has a volume of 0.2 km^3 (0.05 mi^3) and traveled 2–3 km (1–2 mi) from its source.	Slope Movements—primarily mapped beneath the surface of Crater Lake. Includes Chaski Bay landslide deposit. Crater Lake Caldera and Fill—helped to fill caldera/basin of Crater Lake.	Postcaldera Basin Filling.
	Mazama deposits, undivided (Hmz)	Mount Mazama deposits, undivided (Hmu)	Jenks et al. (2008)	Air-fall tuff and rhyodacite tuff.	Mount Mazama and Mazama Ash—associated with Plinian eruption of Mount Mazama.	Climactic Eruption of Mount Mazama.
	Mount Mazama; rhyodacite of the postcaldera dome, lava (Hr) and breccia (Hrb)	Mount Mazama postclimactic dome, rhyodacite, lava and breccia (Hmpr)	Bacon (2008)	Finely porphyritic medium-gray rhyodacite (71.5% SiO_2) lava (**Hr**) and breccia (**Hrb**) of small dome reaching within 27 m (89 ft) of the lake surface east-northeast of Wizard Island.	Volcano Hazards—represents volcanic activity since climactic eruption. Crater Lake Caldera and Fill—postcaldera volcanic rocks helped to fill caldera.	Postcaldera Volcanism. Radiocarbon age: 4,240 ± 290 years before present (BP), or approximately 4,800 calendar years old.
	Mount Mazama; andesite of Wizard Island, lava flows (Haw), breccia (Hawb), and cinder cone (Hawp)	Mount Mazama postclimactic eruption andesites (Hmpa)	Bacon (2008)	Porphyritic, commonly seriate-textured, dark-gray to grayish-black blocky andesite (58.5%–60% SiO_2) lava flows (**Haw**) and breccia (**Hawb**). Lava forming Wizard Island was extruded from vents at base of cinder cone (**Hawp**) and flowed into lake, forming pillowed flows and glassy breccia mantling the slopes below the lake's surface.	Volcano Hazards—represents volcanic activity since climactic eruption. Shield Volcanoes and Cinder Cone—only postcaldera cinder cone. Crater Lake Caldera and Fill—postcaldera volcanic rocks helped to fill caldera.	Postcaldera Volcanism. Approximately 7,200 years old.
	Mount Mazama; andesite of Merriam Cone, lava (Hamc) and breccia (Hamcb)		Bacon (2008)	Porphyritic medium- to dark-gray blocky andesite (60.5% SiO_2) lava (**Hamc**) and breccia (**Hamcb**) of 430-m- (1,410-ft-) high subaqueous cone south of Pumice Point.	Volcano Hazards—represents volcanic activity since climactic eruption. Crater Lake Caldera and Fill—postcaldera volcanic rocks helped to fill caldera.	Postcaldera Volcanism. Only a few hundred years younger than the caldera.
	Mount Mazama; andesite of central platform, lava (Hapc) and breccia (Hapcb)		Bacon (2008)	Porphyritic andesite (57.5%–62.5% SiO_2) lava (**Hapc**) and breccia (**Hapcb**) of 300-m- (980-ft-) high flat-topped mound beneath west-central part of Crater Lake and lava-flow fields to north and east.	Volcano Hazards—represents volcanic activity since climactic eruption. Crater Lake Caldera and Fill—postcaldera volcanic rocks helped to fill caldera.	Postcaldera Volcanism. The central platform volcano was active during the filling of Crater Lake, concurrently with the early eruptions of the Wizard Island volcano. Models for filling Crater Lake suggest that eruption of the central platform volcano ceased within at most 200 years after collapse of the caldera.
	Mount Mazama; andesite of east basin, breccia (Hae)		Bacon (2008)	Probable lava flows extending 1.7 km (1.1 mi) south of east basin in Crater Lake. Possible vent obscured by landslide deposits (**Hls)** south of mapped extent of unit **Hae**.	Volcano Hazards—represents volcanic activity since climactic eruption. Crater Lake Caldera and Fill—postcaldera volcanic rocks helped to fill caldera. East basin is deepest basin on the caldera floor.	Postcaldera Volcanism. Younger than caldera collapse.

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QUATERNARY (Holocene)	Lacustrine deposits (Hla)	Lake deposits (Hl)	Sherrod (1991)	Unconsolidated crystal-lithic-pumice sand and gravel adjacent to Diamond Lake (north of Crater Lake National Park).	None reported.	None reported.
QUATERNARY (Holocene)	Mount Mazama; deposits of the climactic eruption, fine-grained lithic- and crystal-rich ignimbrite (Hcu)	Mount Mazama climactic eruption, fine-grained lithic- and crystal-rich ignimbrite (Hmcfi)	Bacon (2008)	Primary deposit is gray or reddish-brown, fine-grained crystal-rich nonwelded or, rarely, indurated ignimbrite that either overlies unit **Hcb** on slopes and interfluves or grades laterally into unit **Hcb** or **Hcf** in valleys. Consists of either a few meters of late-deposited ignimbrite veneer or thicker deposits of fine-grained ignimbrite near the heads of valleys. Also includes areas of fine-grained lithic breccia, pumiceous or scoriaceous ignimbrite, and fall deposits that are poorly exposed or too small to map separately.	Mount Mazama and Mazama Ash—deposited during climactic eruption, ring-vent phase. Includes some ash material from climactic eruption.	Climactic Eruption of Mount Mazama.
QUATERNARY (Holocene)	Mount Mazama; deposits of the climactic eruption, lithic breccia (Hcb)	Mount Mazama climactic eruption, lithic breccia (Hmcbl)	Bacon (2008)	Typically massive, clast-supported deposit consisting of a variety of types of lithic fragments within a sand-sized matrix of lithic fragments and crystals that is poor in vitric ash. Many blocks are cracked or shattered, yet coherent. Clast lithologies correlate with geographic position around the caldera.	Mount Mazama—deposited during climactic eruption, ring-vent phase. Glacial Features—deposited on glaciated lava.	Climactic Eruption of Mount Mazama.
QUATERNARY (Holocene)	Mount Mazama; deposits of the climactic eruption, ring-vent-phase ignimbrite (Hcf)	Mount Mazama climactic eruption, ring-vent-phase ignimbrite (Hmcri)	Bacon (2008)	Consists of poorly sorted rhyodacitic pumice (70.5% SiO_2) and crystal-rich andesitic to mafic-cumulate scoria (61%–47% SiO_2; up to 25% MgO) clasts, vitric ash, crystals, and lithic fragments.	Mount Mazama—deposited during climactic eruption, ring-vent phase. The Pinnacles are composed of **Hcf**. Caves—The Music Shell–Llao's Hallway of Allen (1984) formed in pumice and ash flow near junction of Castle and Little Castle creeks.	Climactic Eruption of Mount Mazama.
QUATERNARY (Holocene)	Ash-flow deposits (Haf)	Mount Mazama climactic eruption, ring-vent-phase ignimbrite (Hmcri)	Sherrod (1991); MacLeod and Sherrod (1992)	Pumiceous rhyodacitic to dacitic ash-flow deposits.	Mount Mazama—deposited during climactic eruption.	Climactic Eruption of Mount Mazama. Derived from climactic eruption of Mount Mazama immediately after pumice-fall deposits (**Hpf**) of Mount Mazama.
QUATERNARY (Holocene)	Ash-flow deposits; ash-cloud deposits (Haf(fg))	Mount Mazama climactic eruption, ring-vent-phase ignimbrite (Hmcri)	Sherrod (1991)	Fine-grained ash-cloud deposits that separated from the main parts of ash flow.	Mount Mazama—only slightly younger than the Mount Mazama climactic eruption.	Climactic Eruption of Mount Mazama. Overlies but is only slightly younger than magmatically related pumice-fall deposits (**Hpf**).
QUATERNARY-TERTIARY (Holocene–Pliocene)	Ash-flow deposits concealing mafic vent deposits (Haf/QTmv)	Mount Mazama climactic eruption, ring-vent-phase ignimbrite (Hmcri)	Sherrod (1991)	Ash-flow deposits (**Haf**) concealing mafic vent deposits (**QTmv**).	Mount Mazama—deposited during climactic eruption.	Climactic Eruption of Mount Mazama.
QUATERNARY (Holocene)	Pumice-fall deposits (Hpf)	Mount Mazama climactic eruption, ring-vent-phase ignimbrite (Hmcri)	Sherrod (1991); MacLeod and Sherrod (1992)	Air-fall deposits of pumiceous lapilli and ash.	Mount Mazama and Mazama Ash—ash from climactic eruption blankets most of area mapped by MacLeod and Sherrod (1992).	Climactic Eruption of Mount Mazama. Radiocarbon age: 7,650 ± 55 years BP.
QUATERNARY-TERTIARY (Holocene–Pliocene)	Pumice-flow deposits concealing mafic vent deposits Hpf/QTmv	Mount Mazama climactic eruption, pumice-flow deposits (Hmcpf)	Sherrod (1991)	Pumice-flow deposits (Hpf) concealing mafic vent deposits (QTmv).	Mount Mazama—deposited during climactic eruption.	Climactic Eruption of Mount Mazama.

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QUATERNARY (Holocene)	Pumice and ash of Mount Mazama (Hpm)	Mount Mazama climactic eruption, ring-vent-phase ignimbrite (Hmcri)	Smith et al. (1982)	White, pink, buff, gray, and black rhyodacite, dacite, and andesite, unwelded to partly welded ash-flow tuff, ash-cloud deposits, and unconsolidated ash-fall deposits.	None reported.	Climactic Eruption of Mount Mazama.
	Mount Mazama; Wineglass Welded Tuff of Williams (1942) (Hcw)	Mount Mazama climactic eruption, Wineglass Welded Tuff of Williams (1942) (Hmcwt)	Bacon (2008)	Pinkish-orange to light-brown, partly welded to densely welded ignimbrite as much as 10 m (30 ft) thick in paleovalleys at the caldera rim and thin to absent on topographic highs. Consists of up to four flow units that form a single cooling unit. Juvenile clasts are mostly (>99%) rhyodacite and rare andesite.	Mount Mazama—deposited during climactic eruption, single-vent phase; formed as a result of collapse of Plinian column.	Climactic Eruption of Mount Mazama.
	Mount Mazama; Plinian and other Holocene pumice-fall deposits (Hcp)	Mount Mazama climactic eruption, Plinian and other Holocene pumice-fall deposits (Hmcp)	Bacon (2008)	Consists of bedded, well-sorted rhyodacitic pumice lapilli and bombs with a total thickness of as much as 20m (70 ft) at the caldera rim.	Mount Mazama and Mazama Ash—ash from climactic eruption, single-vent phase.	Climactic Eruption of Mount Mazama.
	Mount Mazama; Holocene preclimactic rhyodacite—felsite (Hrh), vitrophyre (Hrhv), pumiceous carapace (Hrhc), and phyclastic (Hrhp)	Mount Mazama climactic eruption, rhyodacite (Hmer)	Bacon (2008)	Porphyritic rhyodacite of the Llao Rock and Cleetwood flows of Williams (1942) and related pyroclastic deposits and dikes in the northern caldera wall. Lava outcrops of medium-gray pumiceous carapace (**Hrhc**), dark-gray to black obsidian (vitrophyre; **Hrhv**), and medium-light-gray felsite (**Hrh**) mapped separately where possible; pumice-fall deposits (**Hrhp**) are shown where sufficiently thick.	Slope Movements—steep slopes, composed of **Hrhv** and **Qt** along the Cleetwood Cove Trial, are prone to rockfall. Mount Mazama—rhyodacite lava flows and domes helped to build up Mount Mazama. Represents early leaks from the top of the climactic magma chamber. Glacial Features—**Hrh** of Llao Rock lies on glacial till; good exposures along the trail to the boat landing. Caves—North Entrance Cave of Allen (1984) formed in rhyodacite on the backside of Llao Rock; Rugged Crest Caves formed in Cleetwood rhyodacite flows (possibly **Hrhrv** or **Hrh**).	Rhyodacite Domes and Flows. Part of preclimactic domes that erupted 30,000–7.700 years ago.
	Mazama deposits, undivided (Hmz1)	Mount Mazama deposits, undivided (Hmu)	Jenks et al. (2008)	Air-fall tuff and rhyodacite tuff.	Mazama Ash—associated with Plinian eruption of Mount Mazama.	Climactic Eruption of Mount Mazama.
	Mazama potholes (Hmzp)	Mount Mazama climactic eruption, ring-vent-phase ignimbrite (Hmcri)	Jenks et al. (2008)	Ash-flow rhyodacite tuff breccia.	None reported.	Climactic Eruption of Mount Mazama.
QUATERNARY (Early Holocene or late Pleistocene)	Regional volcanism, southwest; basalt of Castle Point—lava (Qbc) and pyroclastic (Qbcp)	Southwest volcanism (Cascades), basalt (QTswb)	Bacon (2008)	Medium-gray variably porphyritic basalt, high-alumina olivine tholeiite (HOAT; 48%–50% SiO_2) lava (**Qbc**) and grayish-red cinders (**Qbcp**) at Castle Point, southwest of the caldera.	Glacial Features—not modified by glacial activity; overlies lateral moraines west and north of Castle Point of last glacial maximum.	Regional Volcanism. Youngest regional volcano (<16,000–14,000 years old).
QAUTERNARY (Holocene and Pleistocene)	Alluvium (Qal)	Alluvial deposits (Qal)	Smith et al. (1982); MacLeod and Sherrod (1992); Jenks et al. (2008)	Mixed fluvial sediment. Sand and gravel of active stream beds.	Glacial Features—includes some upper Pleistocene outwash deposits.	None reported.

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QUATERNARY	Alluvial fan deposits (Qafn)	Alluvial deposits (Qal)	Jenks et al. (2008)	Mixed alluvial sediments.	None reported.	None reported.
QAUTERNARY (Holocene and Pleistocene)	Talus (Qt)	Slope movements (Qsm)	Bacon (2008)	Unconsolidated talus and thick colluvium. Beneath lake surface, includes post–7,700-year-old talus, scree, sand, and probable debris-flow and minor landslide material generally sloping at least 13°.	Slope Movements—occurs both inside and outside the rim of Crater Lake caldera. Steep slopes, composed of Qt and Hrhv, along the Cleetwood Cove Trail are prone to rockfall. Crater Lake Caldera and Fill—provides material to caldera/basin of Crater Lake.	Postcaldera Volcanism and Basin Filling.
	Landslide debris (Qls)		Sherrod (1991)	Earthflow and slumps. Some deposits show hummocky topography where debris has moved onto flat terrain; other deposits plaster canyon walls.	Slope Movements—map shows only largest deposits in vicinity of Crater Lake National Park (e.g., in the Rogue River valley). Crater Lake Caldera and Fill—unit occurs outside the caldera. Compare to Hls that occurs within Crater Lake caldera.	Corresponds to timing of postcaldera deposits.
QAUTERNARY (Holocene? and Pleistocene)	Cinder cone and fissure vent deposits (Qcv)	Cascades volcanism, cinder cone and fissure vent deposits (Qcv)	MacLeod and Sherrod (1992)	Unconsolidated to agglutinated cinders, bombs, and blocks. Deposits mark vents for basaltic andesite (**Qba**), basalt and basaltic andesite of Mount Bachelor (**Qbb**), and the younger and older basaltic andesites of Cascade Range (**Qbc** and **QTbc**).	Shield Volcanoes and Cinder Cones—represents cinder cones and vents older than Mount Mazama climactic eruption. Mazama Ash—some cones buried by ash from climactic eruption.	Regional Volcanism. Older than pumice-fall deposits (**Qpf**) of Mount Mazama.
	Younger basaltic andesite (Qyba)	Cascades volcanism, younger basaltic andesite (Qcyba)	Sherrod (1991)	Lava flows and breccia of medium-gray and grayish-red, vesicular to massive, slightly porphyritic basaltic andesite. Locally includes basalt and andesite.	Glacial Features and Processes—most of the unit is glaciated.	Regional Volcanism. Less than about 250,000 years old.
QAUTERNARY Holocene and Pleistocene)	Volcanic rocks of the High Cascade Range; andesite (Qa)	Southwest volcanism (Cascades), andesite (QTswa)	Smith et al. (1982)	Rocks of this unit are extremely varied in texture and mineralogy, but majority are porphyritic pyroxene andesite.	Shield Volcanoes and Cinder Cones—forms youthful-looking stratovolcanoes, steep-sided shields, and smaller vent areas.	Regional Volcanism.
	Volcanic rocks of the High Cascade Range; dacite and rhyolite (Qd)	Mount Mazama preclimactic eruption, rhyodacite (Qmer)	Smith et al. (1982)	Gray to black stubby flows and domes. Crops out only in Crater Lake National Park.	None reported.	Regional Volcanism.
	Volcanic rocks of the High Cascade Range; younger pyroclastic deposits of basaltic and andesitic cinder cones (Qp)	Mount Mazama preclimactic eruption, basaltic andesite (Qswba)	Smith et al. (1982)	Unconsolidated to poorly consolidated well-stratified red, brown, and black, fine- to coarse-grained basaltic to andesitic ejecta of ash, cinder, scoria, agglomerate, and bombs. Includes minor flows and feeder dikes, as well as yellow to buff-colored tuff, deposited in tuff rings.	None reported.	Regional Volcanism.
	Volcanic rocks of the High Cascade Range; intermediate intrusive rocks (Qii)		Smith et al. (1982)	Many small intrusive bodies are present in the volcanic rocks of the High Cascade Range. Unit mostly consists of solidified lava in central conduits, plugs, dikes, and sills. Only the larger bodies are shown on the map.	None reported.	Regional Volcanism.

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QAUTERNARY (Holocene and Pleistocene)	Glacial deposits (Qg)	Glacial deposits (Qg)	Jenks et al. (2008)	No description provided.	Glacial Features and Processes—glacial deposits in southern and western parts of Crater Lake National Park.	Coeval with buildup of Mount Mazama.
QUATERNARY	Sedimentary deposits (Qs)	Undivided sediments (Qs)	Jenks et al. (2008)	Mixed fluvial and lacustrine deposits.	None reported.	None reported.
	Andesite of Egan Springs (Qega)	East volcanism (Cascades), andesite (Qea)	Jenks et al. (2008)	Andesite flows.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park.	Regional Volcanism.
	Basalt of Sun Pass (Qsun)	East volcanism (Cascades), basalt (QTeb)	Jenks et al. (2008)	Basalt flows.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park.	Regional Volcanism.
QUATERNAR (Pleistocene)	Glacial deposits, undivided (PEg)	Glacial deposits (Qg)	Bacon (2008)	Till and minor associated outwash forming a discontinuous mantle on the slopes of Mount Mazama. Characterized by a heterolithologic assemblage of dense, abraded or rounded volcanic clasts and presence of ultrafine material in unsorted matrix.	Crater Lake, Lake Level—till in northeastern caldera wall is permeable layer that allows leakage and maintains lake level. Glacial Features—comprises all glacial deposits mapped by Bacon (2008).	Glaciations are coeval with buildup of Mount Mazama.
QUATERNARY (Late Pleistocene)	Mount Mazama; rhyodacite of Sharp Peak (PErs)	Mount Mazama preclimactic eruption, rhyodacite (Qmer)	Bacon (2008)	Porphyritic medium-gray rhyodacite (70.5% SiO_2) lava composing 12 small domes.	Mount Mazama—rhyodacite lava domes and flows that are part of preclimactic buildup of Mount Mazama. Represents early leaks from the top of the climactic magma chamber. Glacial Features—glaciated during last Pleistocene ice advance.	Rhyodacite Domes and Flows. $^{40}Ar/^{39}Ar$ isochron age: 18,000 ± 4,000 years ago. Glaciations—marine isotope stage (MIS) 2.
	Mount Mazama; andesite south of Bear Bluff, pyroclastic (PEabp), lava (PEab), and tuff breccia (PEabt).	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium-dark-gray andesite (58%–59.5% SiO_2) capping lava (**PEab**), oxidized cinders and bombs (**PEabp**) of subaerial vent at southeastern top of tuya, and palagonitic tuff (**PEabt**) containing bombs as large as 60 cm (24 in) across and underlying lava of tuya south of Bear Bluff. Note: **PEabt** is listed here with other units associated with the andesite of Bear Bluff but is actually older than unit **PErbb**.	Glacial Features—PEab forms a tuya.	Coeval with Rhyodacite Domes and Flows—**PErbb** ($^{40}Ar/^{39}Ar$ isochron age: 24,000 ± 3,000 years ago). Glaciations—erupted during last glacial maximum (MIS 2).
	Mount Mazama; rhyodacite of Bear Bluff (PErbb)	Mount Mazama preclimactic eruption, rhyodacite (Qmer)	Bacon (2008)	Medium-light-gray porphyritic rhyodacite (69.5% SiO_2) lava dome at the northern edge of tuya of unit **PEab** in south-central part of map. Grayish-black vitrophyre present locally along southern margin. Composition similar to, but slightly less differentiated than, rhyodacite of climactic eruption.	Mount Mazama—rhyodacite lava domes and flows that are part of preclimactic buildup of Mount Mazama. Represents early leaks from the top of the climactic magma chamber. Glacial Features—Bear Bluff is glaciated hill at northern end of **PEab** tuya.	Rhyodacite Domes and Flows. $^{40}Ar/^{39}Ar$ isochron age: 24,000 ± 3,000 years ago. Emplaced during last glacial maximum. Glaciations—MIS 2.

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QUATERNARY (Late Pleistocene)	Mount Mazama; evolved Pleistocene preclimactic rhyodacite, felsite (PEre), pyroclastic (PErep), vitrophyre (PErev), pumiceous carapace (PErec)	Mount Mazama preclimactic eruption, rhyodacite (Qmer)	Bacon (2008)	Porphyritic rhyodacites (70%–72% SiO_2) of Redcloud and Grouse Hill flows of Williams (1942), dome at northern caldera rim above Steel Bay, and related pyroclastic deposits that are the most chemically evolved (differentiated) of the Pleistocene preclimactic rhyodacites. Lava outcrops of medium-gray pumiceous carapace (**PErec**), dark-gray obsidian (vitrophyre; **PErev**), and medium-light-gray felsite (**PEre**) mapped separately where possible. Pumice-fall deposit (**PErep**), locally exposed beneath Redcloud flow in caldera wall and on road to Redcloud Cliff viewpoint.	Mount Mazama—rhyodacite lava domes and flows that are part of preclimactic buildup of Mount Mazama. Represents early leaks from the top of the climactic magma chamber. Glacial Features—**PEre** has ice-contact features on Redcloud and Grouse Hill flows, also ice-bounded lava at Grouse Hill. Caves—Bear Creek Cave of Allen (1984) formed at the northeastern end of the Redcloud rhyodacite; largest known cave in Crater Lake National Park.	Rhyodacite Domes and Flows. About 27,000 years old. Glaciations—MIS 2 or 3.
	Regional volcanism, northwest; basaltic andesite northwest of Williams Crater, lava (PEbwn) and pyroclastic (PEbwnp)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Medium-dark-gray porphyritic basaltic andesite (52.5% SiO_2) lava flow (**PEbwn**) and small cinder cone remnant (**PEbwnp**) 2.6 km (1.6 mi) north-northwest of Williams Crater, west-northwest of Crater Lake caldera.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism.
	Mount Mazama; mingled lava of Williams Crater (PEmw)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Coarsely porphyritic light-gray dacite interlayered (mingled) with dark-gray hybrid andesite (60.5%–67% SiO_2) forming small dome and lava flows. Assigned to Mount Mazama because dacitic magma of unit was derived from that source.	Mount Mazama—part of Williams Crater complex.	Buildup of Mount Mazama. About 35,000 years old.
	Regional volcanism, northwest; basaltic andesite of Williams Crater, lava (PEbw) and pyroclastic (PEbwp)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Medium-gray porphyritic basaltic andesite (51.5% SiO_2) lava flow (**PEbw**) and grayish-red cinders (**PEbwp**) of Williams Crater complex west of Crater Lake caldera.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism. About 35,000 years old.
	Regional volcanism, northwest, basaltic andesite northwest of Red Cone (PEbrw)		Bacon (2008)	Medium-gray porphyritic basaltic andesite (53.5% SiO_2) lava flows erupted from vent 1.7 km (1.1 mi) north of Red Cone, northwest of Crater Lake caldera. Similar to lavas of unit **PEbr** but contains larger plagioclase phenocrysts.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism. About 35,000 years old.
	Regional volcanism, northwest; basaltic andesite of Red Cone, lava (PEbr) and pyroclastic (PEbrp)		Bacon (2008)	Light- to medium-gray porphyritic basaltic andesite (52.5%–54% SiO2) lava flows (**PEbr**), bombs, and cinders (**PEbrp**) erupted from vent marked by Red Cone and from fissure vent system 1.5 km (0.9 mi) north of Red Cone, northwest of the caldera. Lava flowed to west-northwest around source of unit **PEarw** to within approximately1 km (0.6 mi) of Oasis Butte.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek. Glacial Features and Processes—Red Cone is heavily glaciated (Bacon 1983).	Regional Volcanism. K-Ar age: 36,000 ± 12,000 years ago; $^{40}Ar/^{39}Ar$ plateau age: 35,000 ± 4,000 years ago.
	Regional volcanism, southwest; basaltic andesite north of Little Castle Creek (PEblcp)	Mount Mazama preclimactic eruption, basaltic andesite (Qmeba)	Bacon (2008)	Dark-gray porphyritic basaltic andesite (52.5% SiO_2) bombs and grayish-red cinders of breached cone and adjacent tephra mantle on northern wall of valley of Castle Creek near confluence with Little Castle Creek, southwest of the caldera.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. Preservation of cone and tephra at valley margin suggests that the unit erupted during last interglacial.
	Regional volcanism, northwest; basalt east of Oasis Butte (PEboe)	Northwest volcanism (Cascades), basalt (QTnwb)	Bacon (2008)	Medium-gray porphyritic basalt lava at northern-northwestern boundary of map area; part of extensive field of similar basalt (high-alumina olivine tholeiite, HAOT; 48.5%, rarely to 50% SiO_2) flows from vent marked by low cinder mound 1.5 km (0.9 mi) east-southeast of Bald Crater (north of map area).	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism. K-Ar and paleomagnetic data suggest similar age to overlying unit **PEbr** ($^{40}Ar/^{39}Ar$ plateau age 35,000 ± 4,000 years ago).

Gray-shaded units are not mapped within Crater Lake National Park. Refer to the "Geologic Map Data" section of the report for information regarding how the GIS units were grouped on the Simplified Geologic Map.

Age	GRI GIS Map Unit (Symbol) *GIS data online and on CD*	Simplified Geologic Map Unit (Symbol) *poster in pocket*	Source Map	Geologic Description	Geologic Issues, Features, and Processes	Geologic History
QUATERNARY (Late Pleistocene)	Mount Mazama; dacite of Munson Valley, prismatically jointed block unit (PEdvb) and monolithologic breccia (PEdv)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Unconsolidated fragmental deposits of porphyritic dacite (juvenile clasts contain 63.5%–69.5% SiO_2; most <65%) mainly on the southwestern flank of Mount Mazama. **PEdv** is monolithologic breccia with medium-gray to grayish-black dense to pumiceous dacite clasts, is locally oxidized reddish brown or bleached. **PEdv** is a debirs-avalanche deposit formed by collapse of a lava dome high on the southwestern flank of Mount Mazama. The apparently younger **PEdvb** is characterized by medium-light to medium-dark-gray, dense, intact prismatically jointed blocks 1 m (3 ft) across, rarely to 3 m (10 ft), commonly is heterolithologic containing a variety of lithic blocks. **PEdvb** deposited by pyroclastic flows originating at the same source as and virtually contemporaneous with the monolithologic avalanches.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Prismatically jointed blocks in **PEdvb** record an unusual paleomagnetic pole position similar to that of **PEbr**, which has K-Ar and $^{40}Ar/^{39}Ar$ ages of 36,000 ± 12,000 years ago and 35,000 ± 4,000 years ago, respectively.
	Mount Mazama; andesite of Lightning Spring (PEals)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium- to dark-gray andesite (61.5%–65.5% SiO_2; most <64% SiO_2) lava flows at the caldera rim from west of Rim Village northwest to the Lightning Spring trailhead, where unit is well exposed in road cuts, and on the southwestern flank of Mount Mazama as far as 4 km (2.5 mi) from the caldera in the drainage of Bybee Creek. Pumiceous vitric pillow-like blocks, to 1.5 m (5 ft) across, form surface overlain by till 1.3 km (0.8 mi) west of Discovery Point parking area as though lava flowed in meltwater channel beneath ice; alternatively, blocks are cauliflower bombs in a volcanic flowage deposit.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 47,000 ± 8,000 years ago.
	Mount Mazama; andesite of Steel Bay (PEasb)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium- to dark-gray andesite (59%–61% SiO_2) lava flows high on the caldera wall.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar ages: 43,000 ± 6,000 and 42,000 ± 6,000 years ago.
	Mount Mazama; andesite of Pumice Point (PEapu)		Bacon (2008)	Sparsely porphyritic medium-gray andesite (59.5%–61% SiO_2).	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 47,000 ± 20,000 years ago.
	Regional volcanism, southwest; basaltic andesite of Scoria Cone, lava (PEbsc) and pyroclastic (PEbscp)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Medium-gray porphyritic basaltic andesite (54.5%–55% SiO_2) lava flows (**PEbsc**) and cinders (**PEbscp**) erupted from Scoria Cone (just south of map area) and associated vents in 1-km- (0.6-ft-) long, north–northeast alignment between Pumice Flat and Annie Creek.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. $^{40}Ar/^{39}Ar$ plateau age of **PEbsc**: 53,000 ± 4,000 years ago.
	Mount Mazama; andesite of Devils Backbone (PEad)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Moderately porphyritic dark- to light-gray andesite (57.5%–61% SiO_2; most 60%–61% SiO_2) lava flows, emanating from a vent fed by the Devils Backbone dike on western caldera wall.	Mount Mazama—part of volcano edifice. Glacial Features—glacial activity removed parts of lava flows.	Buildup of Mount Mazama. Probable age 50,000–40,000 years ago. Glaciations—MIS 2.
	Mount Mazama; dacite of The Watchman, felsite (PEdwf), pumiceous carapace and dense vitrophyre (PEdwv), and pyroclastic-flow deposits (PEdwp)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic dacite (65.5%–68% SiO_2; most 67%) forming The Watchman flow of Williams (1942), its feeder dike, and pumiceous pyroclastic-flow deposits in the western caldera wall and locally preserved on ridge top approximately 4 km (2.5 mi) west of Rim Village. Medium-gray pumiceous carapace (upper surface of The Watchman flow) and grayish-black to black dense vitrophyre (**PEdwv**), medium-light-gray crystalline lava and dike (**PEdwf**), and nonwelded to densely welded vitric pyroclastic-flow deposits (**PEdwp**).	Mount Mazama—part of volcano edifice. Glacial Features—**PEdwp** overlies glaciated lava surface on **PEaww** in western caldera wall between The Watchman and Discovery Point.	Buildup of Mount Mazama. K-Ar age: 50,000 ± 3,000 years ago. Glaciations—MIS 4.
	Mount Mazama; andesite south of The Watchman (PEatw)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Coarsely porphyritic medium-light-gray silicic andesite (62.5%–63.5% SiO_2) forming thick lava flows on western caldera rim.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 55,000 ± 3,000 years ago.
	Mount Mazama; andesite of Hillman Peak (PEah)		Bacon (2008)	Markedly porphyritic dark- to medium-light-gray andesite (57.5%–59% SiO_2) lava flows forming summit of Hillman Peak and exposed in western caldera walls and on western flank of Mount Mazama. Vent was east of Hillman Peak.	Mount Mazama—part of volcano edifice. Form summits of westernmost andesitic stratovolcano that makes up Mount Mazama.	Buildup of Mount Mazama. K-Ar age: 61,000 ± 8,000 years ago.

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QUATERNARY (Late Pleistocene)	Mount Mazama; dacite below Llao Rock (PEdlp)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic pinkish- to brownish-gray and medium-dark-gray dacite pumice (66%–67.5% SiO_2) occurring as fall and pyroclastic-flow deposits in northwestern and northern caldera walls from north of Devils Backbone to Palisade Point. Welded fall deposit dipping into caldera wall above Steel Bay indicates proximity to vent to south, in area of present caldera.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Approximately 70,000 years old.
	Mount Mazama; andesite of Grotto Cove (PEagc)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium-light- to medium-dark-gray andesite (61.5%–63% SiO_2) lava flows in the caldera wall from Pumice Point (northern wall) to Cleetwood Cove. Forms 100-m- (330-ft-) high cliffs at caldera rim at Grotto Cove (northeastern wall). Includes related block-and-ash flow deposit between flows at Grotto Cove.	Mount Mazama—part of volcano edifice. Glacial Features—has ice-contact feature at Grotto Cove. Caves—Castle Creek Caves of Allen (1984) formed in mudflow deposit underlying andesite flow on steep cliff on the eastern side of Munson Valley; can see these caves from park headquarters.	Buildup of Mount Mazama. K-Ar age: 71,000 ± 5,000 years ago. Glaciations—MIS 4.
	Mount Mazama; basaltic andesite of Hillman Peak, lava (PEbh), intrusive (PEbhi), and pyroclastic (PEbhp)	Mount Mazama preclimactic eruption, basaltic andesite (Qmeba)	Bacon (2008)	Medium-gray porphyritic hornblende basaltic andesite and andesite (55.5%–59% SiO_2) lava flows (**PEbh**), intrusions (**PEbhi**), and fall deposits (**PEbhp**) of western caldera wall and flank of Mount Mazama. Distinguished by ubiquitous hornblende needles, which appear black in hand specimens.	Mount Mazama—part of volcano edifice. Part of westernmost andesitic stratovolcano that makes up Mount Mazama.	Buildup of Mount Mazama. K-Ar age: 73,000 ± 6,000 years ago.
	Mount Mazama; dacite of Pumice Castle, lava (PEdc) and pyroclastic (PEdcp)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic light- to dark-medium-gray dacite lava flows (**PEdc**; 66%–67% SiO_2) in caldera wall from north of Devils Backbone east to Cloudcap Bay, at Cloudcap, and forming Scott Bluffs. Extensive Plinian fall of pinkish-gray to light-brown dacite pumice (**PEdcp**; 66%–68% SiO_2) forms approximately 75-m- (250-ft-) thick deposit of alternating welded and nonwelded layers at Pumice Castle and nonwelded fall, pyroclastic-flow, or reworked deposits exposed locally from north of Devils Backbone to Palisade Point, above Cloudcap Road, and in small exposure in roadcut near intersection of Rim Drive with Dutton Ridge.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Approximately 71,000 years old.
	Mount Mazama; andesite of the west wall (PEaww)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Finely porphyritic seriate-textured medium- to dark-gray andesite (57%–61% SiO_2) lava flows exposed in western caldera wall and on the western flank of Mount Mazama as far as 5–7 km (3–4 mi) west of the caldera rim.	Mount Mazama—part of volcano edifice. Glacial Features—**PEaww** has glaciated lava surface and overlies glaciated lava surface on **PEdsb** at Steel Bay. **PEaww** glaciated surface overlain by **PEdwp**.	Buildup of Mount Mazama. K-Ar age: 70,000 ± 4,000 years ago. Glaciations—MIS 4.
QUATERNARY (Late? Pleistocene)	Regional volcanism, east; andesite of Scott Creek, lava (PEasc) and pyroclastic (PEascp)	East volcanism (Cascades), andesite (Qea)	Bacon (2008)	Porphyritic medium-gray olivine andesite (57.5%–59% SiO_2) lava flow (**PEasc**) and source vent marked by eroded cinder cone (**PEascp**) southeast of caldera. Lava crops out locally south of Scott Creek above about 1,630 m (5,350 ft) and forms incised intracanyon flow below about 1,590 m (5,220 ft) in elevation. **Peascp** occurs in Crater Lake National Park, but no**t PEasc**.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. Glaciations—erupted before last glacial maximum (MIS 2), consistent with $^{40}Ar/^{39}Ar$ age of 87,000 ± 15,000 years ago.
QUATERNARY (Late Pleistocene)	Mount Mazama; andesite west of Red Cone (PEarw)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Finely porphyritic seriate-textured medium-gray andesite (59% SiO_2) lava flows.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 84,000 ± 13,000 years ago.
	Mount Mazama; andesite of the boat landing (PEabl)		Bacon (2008)	Porphyritic medium- to dark-gray andesite (63%–63.5% SiO_2) lava flows and underlying related fragmental deposit between Pumice Point and Cleetwood Cove.	Mount Mazama—part of volcano edifice. Glacial Features—trail to boat landing descends along the base of the lower flow of this unit where it lies on probable till.	Buildup of Mount Mazama. K-Ar age: 102,000 ± 10,000 years ago. Glaciations—MIS 5d.
	Mount Mazama; dacite east of Palisade Point (PEdpe)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-light-gray dacite (65% SiO_2) lava flow approximately 150 m (490 ft) thick, forming northeastern caldera wall midway between Palisade Point and Roundtop.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 111,000 ± 9,000 years ago.
	Mount Mazama; andesite west of Pumice Point (PEapw)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic dark-gray andesite lava flows (61% SiO_2) midway up the northern caldera wall and feeder dike (59.5% SiO_2) at Steel Bay.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Possibly about 110,000 years old.

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QUATERNARY (Late Pleistocene)	Mount Mazama; basaltic andesite of Steel Bay, lava (PEbs)	Mount Mazama preclimactic eruption, basaltic andesite (Qmeba)	Bacon (2008)	Medium-dark-gray porphyritic basaltic andesite (53% SiO_2) lava flows.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Approximately 115,000 years old.
	Regional volcanism, east; andesite of Crater Peak, lava (PEacr) and pyroclastic (PEacrp)	East volcanism (Cascades), andesite (Qea)	Bacon (2008)	Moderately porphyritic medium-gray to medium-dark-gray andesite lava flows (**PEacr**) and Crater Peak cinder cone (**PEacrp**) marking vent south of Crater Lake caldera.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar ages: 136,000 ± 8,000 and 98,000 ± 8,000 years ago.
	Regional volcanism, east; basaltic andesite south of Crater Peak (PEbcsp)	East volcanism (Cascades), basaltic andesite (QTeba)	Bacon (2008)	Medium-dark-gray sparsely porphyritic basaltic andesite (53.5% SiO_2) bombs and lava of small exposure that probably mark vent approximately 1 km (0.6 mi) south of Crater Peak south of Crater Lake caldera.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 118,000 ± 48,000 years ago.
QUATERNARY (Late? Pleistocene)	Regional volcanism, east; basaltic andesite north of Crater Peak (PEbcnp)	East volcanism (Cascades), basaltic andesite (QTeba)	Bacon (2008)	Grayish-red oxidized basaltic andesite (53.5% SiO_2) cinders and agglutinate of poorly exposed cinder cone banked against eastern wall of canyon of East Fork of Annie Creek approximately 2 km (1.2 mi) north of Crater Peak, south of Crater Lake caldera.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism.
QUATERNARY (Late Pleistocene)	Regional volcanism, southwest; basaltic andesite northwest of Pumice Flat, lava (PEbf), intrusive (PEbfi), and pyroclastic (PEbfp)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Medium-gray finely porphyritic basaltic andesite (55%–55.5% SiO_2) lava flows (**PEbf**), plugs and dikes (**PEbfi**), and grayish-red cinders (**PEbfp**).	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. K-Ar age: 116,000 ± 24,000 years ago.
	Mount Mazama; dacite of Steel Bay, lava (PEdsb) and pyroclastic (PEdsbp)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-light- to medium-gray dacite (64.5%–66.5% SiO_2) lava and dikes (**PEdsb**) in northern caldera wall from Llao Rock to Pumice Point and pyroclastic-flow deposit (**PEdsbp**) below Hillman Peak carrying medium-dark-gray dacite (64.5% SiO_2) prismatically jointed blocks. Two prominent dikes fed a small dome and a lava flow at Steel Bay.	Mount Mazama—part of volcano edifice. Glacial Features—**PEdsb** has glaciated lava surface at Steel Bay.	Buildup of Mount Mazama. K-Ar ages: 116,000 ± 9,000 and 116,000 ± 5,000 years ago. Glaciations—MIS 4, 5b, and 5d.
	Mount Mazama; andesite of Merriam Point (PEam)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic light-gray to medium-dark-gray andesite (60.5%–61.5% SiO_2) lava flows, domes, and breccia in the northwestern caldera wall from below Hillman Peak to below Llao Rock. Thickest, approximately 200 m (660 ft), near feeder, which displaced and tilted andesite of Llao Bay, lower unit (**PEall)**, southwest of Merriam Point.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 131,000 ± 18,000 years ago.
	Mount Mazama; andesite of Llao Bay, upper unit (PEalu)		Bacon (2008)	Variably porphyritic medium- to dark-gray basaltic andesite and andesite (54.5%–61% SiO_2) lava flows in northwestern caldera wall from Merriam Point to east of Pumice Point. Andesite lava flow forms prominent cliff midway up wall at Steel Bay. Subtle basaltic andesite dike mapped as **PEalu** cuts flows of **PEall** below Llao Rock. Together with unit **PEall** forms broad shield making up lower part of northwestern caldera wall.	Glacial Features—**PEalu** has ice-contact features and overlies glaciated lava surface of **PEall** at Pumice Point.	Buildup of Mount Mazama. $^{40}Ar/^{39}Ar$ age: 117,000 ± 3,000 years ago. Glaciations—MIS 5d.
QUATERNARY (Late and/or Middle Pleistocene)	Sedimentary deposits, undivided (PEs)	Undivided sediments (Qs)	Bacon (2008)	Deposits of clastic sediment exposed locally in the caldera walls. Typically inaccessible and poorly exposed, probably consists of laharic or local fluvial sediment.	Volcano Hazards—probably deposited by a lahar.	Buildup of Mount Mazama.
	Mount Mazama; andesite east of Spruce Lake (PEasl)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium-gray silicic andesite poorly exposed in South Fork of Crater Creek approximately 2 km (1.2 mi) east of Spruce Lake.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Probably older than 80,000–50,000 years old.

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QUATERNARY (Late and/or Middle Pleistocene)	Mount Mazama; dacite of Palisade Point (PEdpt)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-gray dacite (66% SiO_2) lava flow on northern shore of Crater Lake at Palisade Point and east of Pumice Point.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. About 120,000 years old.
QUATERNARY (Middle Pleistocene)	Mount Mazama; andesite of Llao Bay, lower unit (PEall)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Variably porphyritic medium- to dark-gray andesite (57%–60.5% SiO_2) lava flows forming the lowest unit in the northwestern caldera wall from south of Devils Backbone to east of Pumice Point. Together with unit **PEalu** forms broad shield making up lower part of northwestern caldera wall. Consists of coarsely porphyritic lavas below Llao Rock, and finely porphyritic lavas lower in the section.	Mount Mazama—part of volcano edifice. Glacial Features—glaciated surface at Pumice Point.	Buildup of Mount Mazama. Between about 170,000 and 140,000 years old. Glaciations—MIS 5d and 6.
	Mount Mazama; andesite of Roundtop (PEar)		Bacon (2008)	Porphyritic medium-light-gray andesite (62% SiO_2) forming cliff in northeastern caldera wall at Roundtop and extending 2.5 km (1.6 mi) to northeast of caldera rim. Joint pattern in cliffs suggests vent beneath Roundtop.	Mount Mazama—part of volcano edifice. Glacial Features—rests on 115 m (380 ft) of glacial deposits. **PEar** lava is probably an ice-bounded flow.	Buildup of Mount Mazama. K-Ar age: 159,000 ± 13,000 years ago. Glaciations—MIS 6.
	Regional volcanism, east; andesite south of Lookout Butte, lava (PEalb) and pyroclastic (PEalbp)	East volcanism (Cascades), andesite (Qea)	Bacon (2008)	Sparsely porphyritic medium-dark- to dark-gray andesite (59% SiO_2) lava (**PEalb**) and cinder cone (**PEalbp**) marking vent near northeastern map boundary.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 155,000 ± 6,000 years ago.
	Regional volcanism, southwest; basaltic andesite of Union Peak, lava (PEbu), intrusive (PEbui), and pyroclastic (PEbup)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Light- to medium-light-gray porphyritic basaltic andesite (54%–56.5% SiO_2) lava flows (**PEbu**), grayish-red and yellowish-orange (palagonitic) cinders (**PEbup**), and very light gray to medium-light-gray intrusive rock (**PEbui**) composing the Union Peak shield volcano in southwestern part of map area. **PEbup** and **PEbui** are restricted to eroded core preserved as Union Peak itself and in remnants within glacial valley to the north.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek. Glacial Features—glaciers eroded slopes of Union Peak.	Regional Volcanism. K-Ar age: 164,000 ± 11,000 years ago.
	Mount Mazama; andesite east of Munson Valley (PEamv)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium-gray andesite (57% SiO_2) lava flows capping ridge between Middle and East forks of Annie Creek. Vent must have been approximately 500 m (1,640 ft) north of Rim Drive.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 172,000 ± 15,000 years ago.
	Mount Mazama; andesite of the gaging station (PEags)		Bacon (2008)	Porphyritic medium-light-gray andesite (60% SiO_2) lava flow at gauging station west of boat landing, northern shore of Crater Lake.	Mount Mazama—part of volcano edifice. Glacial Features—glaciated surface at gauging station.	Buildup of Mount Mazama. $^{40}Ar/^{39}Ar$ plateau age at gauging station: 189,000 ± 3,000 years ago. Glaciations—MIS 6.
	Regional volcanism, northwest; basaltic andesite of Oasis Butte, intrusive (PEboi), lava (PEbo), and pyroclastic (PEbop)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Medium-gray porphyritic basaltic andesite (53%–53.5% SiO_2) plug (**PEboi**) at Oasis Butte and lava (**PEbo**) and cinders (**PEbop**) vented from Oasis Butte and dissected cinder cone 1 km (0.6 mi) to the south near the northwestern corner of map area. Lava outcrops traced as far southwest as 1,460 m (4,800 ft) in elevation on a tributary of Crater Creek.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism. K-Ar age: 201,000 ± 13,000 years ago.
	Mount Mazama; dacite north of Castle Creek; lava (PEdcn) and pyroclastic (PEdcnp)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Finely porphyritic medium-light- to medium-dark-gray dacite lava (**PEdcn**; 64.5%–66.5% SiO_2) present southwest of the caldera from approximately 1 km (0.6 mi) west of Rim Village to drainages of Copeland and Bybee creeks. Flow forming divide between Bybee and Castle creeks reached at least 10 km (6 mi) west of vent marked by agglutinate (**PEdcnp**). Dikes (65%–66% SiO_2) in caldera wall match compositions and petrography of specific flows, the more northerly dikes corresponding to the relatively crystal-rich, northern flows.	Mount Mazama—part of volcano edifice. Glacial Features—**PEdcn** overlies glaciated lava surface on **PEaa** north of Castle Creek.	Buildup of Mount Mazama. K-Ar age: 216,000 ± 4,000 years ago. Glaciations—MIS 7 and 8.

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QUATERNARY (Middle Pleistocene)	Regional volcanism, east; basalt west of Sun Creek (PEbsw)	East volcanism (Cascades), basalt (QTeb)	Bacon (2008)	Medium-gray coarsely porphyritic basalt (51% SiO_2) lava west of Sun Creek near southern boundary of map area. Apparently extruded from subtle vent at approximately 1,555 m (5,100 ft) in elevation.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. Degree of preservation suggests late middle Pleistocene age.
	Regional volcanism, east; basaltic andesite of Maklaks Crater, lava (PEbmc) and pyroclastic (PEbmcp)	East volcanism (Cascades), basaltic andesite (QTeba)	Bacon (2008)	Grayish-red cinders (**PEbmcp**) of Maklaks Crater cone and associated medium-dark-gray finely porphyritic basaltic andesite (53.5% SiO_2) lava (**PEbmc**) southeast of Crater Lake caldera.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 220,000 ± 67,000 years ago.
	Mount Mazama; andesite of Garfield Peak (PEag)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Moderately porphyritic medium-gray andesite (60.5%–61.5% SiO_2) lava flows and breccia at Garfield Peak, on slope to south, and on the western side of Munson Valley. Characterized by small—<3 mm (0.1 in)—hornblende phenocrysts. Dike (**PEag?**) in caldera wall east of Garfield Peak provisionally assigned to this unit.	Mount Mazama—part of volcano edifice. Glacial Features—**PEag** overlies glaciated lava surface on **PEaa** south of Garfield Peak.	Buildup of Mount Mazama. K-Ar age: 224,000 ± 9,000 years ago. Glaciations—MIS 7 and 8.
	Mount Mazama; dacite south of Garfield Peak (PEdg)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-gray dacite lava (64.5%–65.5% SiO_2) traceable south of the caldera from 1 km (0.6 mi) south of Garfield Peak for nearly 6 km (4 mi) to vicinity of Pole Bridge Creek approximately 2 km (1 mi) southeast of Arant Point; medium-dark-gray to black vitrophyre locally preserved at top of fault scarp north of Arant Point.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Between about 269,000 and 224,000 years old.
	Mount Mazama; andesite of Applegate Peak, lava (PEaa) and intrusive (PEaai)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Light- to dark-gray porphyritic andesite and dacite (57%–66.5% SiO_2) flow-banded lava flows, agglutinated bombs, and near-vent fall deposits. Consists of multiple lava flows believed to have come from Mount Mazama summit vent or possibly satellite vents fed by same magma system. **PEaa** comprises the upper southern slopes of Mount Mazama and high cliffs at Applegate Peak and Dutton Cliff. Small andesite exposure (**PEags**) at lake level on northern side of caldera may be from same source vent as **PEaa**. Correlated with a large intrusive body (**PEaai**) in caldera wall below Applegate Peak.	Mount Mazama—part of volcano edifice. **PEaa** is the most extensive unit of Mount Mazama; it is exposed in the caldera wall from the Wineglass to Discovery Point, as far as 9 km (6 mi) from the eastern rim of the caldera near Scout Hill, and 8 km (5 mi) from the western rim in Bybee Creek. Glacial Features—**PEaa** has widespread ice-contact features, for example at Dutton Cliff and north of Kerr Notch, and glaciated lava surfaces north of Castle Creek and south of Garfield Peak.	Buildup of Mount Mazama. Between about 269,000 and 211,000 years old. Glaciations—MIS 7 and 8.
QUATERNARY (Middle? Pleistocene)	Regional volcanism, northwest; basaltic andesite north of Red Cone (PEbn)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Medium-gray coarsely porphyritic basaltic andesite (52.5% SiO_2) lava flows erupted from fissure system now marked by low north–south ridge, north-central map boundary.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism. May be related to flows from Desert Cone (north of map area; K-Ar age 213,000 ± 26,000 years ago).
QUATERNARY (Middle Pleistocene)	Mount Mazama; andesite east of Wineglass (PEawe)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Strongly porphyritic medium-dark-gray andesite (60%–60.5% SiO_2) lava flows locally exposed low in northeastern caldera wall for approximately 0.5 km (0.3 mi) east of the Wineglass.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Probably about 240,000–220,000 years ago.
	Mount Mazama; andesite of Cloudcap Bay (PEac)		Bacon (2008)	Moderately porphyritic medium-light- to dark-gray andesite (55.5%–60% SiO_2; most >57% SiO_2) sheet-like lava flows midway up the caldera wall between Grotto Cove and Cloudcap Bay and east–northeast-oriented andesite (57.5%–61% SiO_2) dikes south of lava outcrops. Presence of dikes and relative abundance of oxidized reddish-brown scoriaceous material indicate source vent was above Cloudcap Bay.	Mount Mazama—part of volcano edifice. Crater Lake, Lake Level—lava flows that underlie glacial till in northeastern caldera wall; till provides permeable layer for leakage that maintains lake level.	Buildup of Mount Mazama. K-Ar ages: 288,000 ± 13,000 and 231,000 ± 6,000 years ago; older age probably more accurate.
	Mount Mazama; dacite of Munson Ridge (PEdm)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-light- to medium-dark-gray dacite lava (64.5%–65% SiO_2) forming crest of Munson Ridge from 1 km (0.6 mi) south of Rim Drive to Munson Point. Vitric breccia and columns on upper surface, particularly well developed on south-southeastern flank of Munson Point, indicate that lava flowed beneath glacial ice. Joint and flow-banding patterns, and relatively abundant enclaves, suggest vent beneath Munson Point; other vents or eruptive fissures may be present beneath Munson Ridge.	Mount Mazama—part of volcano edifice. Glacial Features—**PEdm** has ice-contact feature at Munson Ridge.	Buildup of Mount Mazama. K-Ar age: 276,000 ± 11,000 years ago. Glaciations—MIS 8.

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	Mount Mazama; andesite west of Fumarole Bay (PEaf)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Finely porphyritic medium-light-gray to medium-gray andesite (61.5%–62% SiO_2) lava flows low in the western caldera wall between Discovery Point and The Watchman.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. K-Ar age: 276,000 ± 8,000 years ago.
QUATERNARY (Middle Pleistocene)	Regional volcanism, northwest; andesite southwest of Oasis Butte (PEao)	Northwest volcanism (Cascades), andesite (QTnwa)	Bacon (2008)	Porphyritic medium-gray andesite lava exposed in block between parallel north–south-oriented normal faults approximately 1–2 km (0.6–1 mi) southwest of Oasis Butte in northwestern corner of map area.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism. Younger than 201,000 years old.
	Regional volcanism, southwest; basaltic andesite of Whitehorse Bluff, lava (PEbx), intrusive (PEbxi), and pyroclastic (PEbxp)	Southwest volcanism (Cascades), basaltic andesite (QTswba)	Bacon (2008)	Medium-gray finely porphyritic basaltic andesite (55%–56.5% SiO_2) lava flows (**PEbx**), grayish-red cinders (**PEbxp**), and medium-gray plugs (**PEbxi**).	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek. Glacial Features—named for lava forming tuya at Whitehorse Bluff southwest of the caldera.	Regional Volcanism. K-Ar age: 217,000 ± 16,000 years ago near southern extreme of outcrop area; northern portion may be older.
	Regional volcanism, southwest; andesite of Arant Point, lava (PEat), vitric (PEatg), and intrusive (PEati)	Southwest volcanism (Cascades), andesite (Qswa)	Bacon (2008)	Sparsely porphyritic to virtually aphyric andesite (57%–58% SiO_2) comprising the hill in the south-central part of the map area known as Arant Point and the down-faulted tuya to the east. Arant Point is the heavily glaciated light-gray intrusive core (**PEati**) of a cinder cone that marks the vent for light- to medium-gray lava of **PEat**. Cinders are locally preserved in the area mapped as at on the hill of Arant Point. **PEatg** is blocky to finely columnar jointed grayish-black vitric andesite of the chilled margin of the intrusion and carapace of the tuya where lava contacted glacial ice.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek. Glacial Features—**PEat** forms tuya at Arant Point.	Regional Volcanism. K-Ar age: 297,000 ± 12,000 years ago. Glaciations—MIS 8.
	Mount Mazama; andesite below Rim Village (PEarv)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium-gray andesite (59%–62% SiO_2) forming lower part of southwestern caldera wall between Rim Village and Discovery Point.	Mount Mazama—part of volcano edifice. Glacial Features—**PEarv** overlies glaciated lava surface of **PEab** on southwestern shore of Crater Lake.	Buildup of Mount Mazama. K-Ar age: 302,000 ± 10,000 years ago. Glaciations—MIS 10.
	Mount Mazama; dacite of Sentinel Rock (PEdr)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-light- to medium-dark-gray dacite lava flows (63%–65.5% SiO_2) in southeastern caldera wall between Skell Head and Kerr Notch. Related fragmental deposit forms lower half of unit approximately 500 m (1,640 ft) south of Skell Head.	Mount Mazama—part of volcano edifice. Glacial Features—**PEdr** overlies glaciated lava surface of **PEak** at Sentinel Rock and Grotto Cove.	Buildup of Mount Mazama. Between about 340,000 and 300,000 years old. Glaciations—MIS 10.
QUATERNARY (Middle? Pleistocene)	Regional volcanism, southwest; basalt northwest of Whitehorse Bluff, lava (PEbxn) and intrusive (PEbxni)	Southwest volcanism (Cascades), basalt (QTswb)	Bacon (2008)	Medium-dark-gray porphyritic basalt and basaltic andesite (51%–54% SiO_2) lava flows (**PEbxn**) and light-gray diabase plug (**PEbxni**) 0.5 km (0.3 mi) north-northwest of Whitehorse Bluff, southwest of the caldera. Intrusive core and flows on top of small cinder cone remnant are coarsely porphyritic basalt.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. Possibly younger than **PEbwc**.
QUATERNARY (Middle Pleistocene)	Regional volcanism, southwest; basaltic andesite west of Arant Point (PEbaw)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Medium-dark-gray sparsely porphyritic basaltic andesite (55.5%–56% SiO_2) extending approximately 1 km (0.6 mi) west of Arant Point in south-central part of map area where it forms low hill marking probable source. Also exposed locally south and north of Arant Point and in cut along Oregon Highway 62 in scarp of Annie Springs fault near park entrance station where **PEbaw** flow overlies **PEbcw** lavas.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. Probably about 200,000 years old.
	Mount Mazama; andesite of Kerr Notch (PEak)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Variably porphyritic andesite and dacite (59%–66% SiO_2; most 60%–63% SiO_2) lava flows exposed in caldera wall from Skell Head (east) to Chaski Bay (south) and in the valleys of Sun and Sand creeks up to 7 km (4 mi) southeast of the caldera.	Mount Mazama—part of volcano edifice. Glacial Features—glaciated lava surfaces at Sentinel Rock and Grotto Cove.	Buildup of Mount Mazama. Between about 340,000 and 300,000 years old. Glaciations—MIS 10.

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	Mount Mazama; dacite of Chaski Bay (PEdb)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic andesite and dacite (59.5%–67% SiO_2; predominantly low-silica dacite) lava flows and breccia exposed low in the southern caldera wall from Kerr Notch to Rim Village, in Kerr and Munson valleys, and near the headwaters of the Middle and East forks of Annie Creek.	Mount Mazama—part of volcano edifice. Glacial Features—glaciated lava.	Buildup of Mount Mazama. Between about 380,000 and 350,000 years old. Glaciations—MIS 10.
QUATERNARY (Middle Pleistocene)	Mount Mazama; andesite south of Mount Scott (PEams)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Porphyritic medium-gray silicic andesite lava (63% SiO_2) forming small dome and flow remnants on southern flank of Mount Scott.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Stratigraphy and degree of erosion suggest an age of approximately 400,000–300,000 years old.
	Regional volcanism, east; basalt of Sand Ridge lava (PEbsr) and pyroclastic (PEbsrp)	East volcanism (Cascades), basalt (QTeb)	Bacon (2008)	Brownish-gray porphyritic basalt (52% SiO_2) lava (**PEbsr**) and cinders (**PEbsrp**) of eroded cone at southeastern boundary of map area.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism.
QUATERNARY (Middle Pleistocene?)	Regional volcanism, east; basaltic andesite northeast of Boundary Butte, lava (PEbt) and pyroclastic (PEbtp)	East volcanism (Cascades), basalt andesite (QTeba)	Bacon (2008)	Medium-dark-gray porphyritic basaltic andesite (54.5%–56.5% SiO_2) lava (**PEbt**) and grayish-red cinders (**PEbtp**) of cone 3 km (2 mi) east-northeast of Boundary Butte and low hill 1 km (0.6 mi) farther north, southeastern corner of map area.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. Morphology suggests middle Pleistocene age.
QUATERNARY (Middle? Pleistocene)	Mount Mazama; dacite of Phantom Cone (PEdpn)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-gray dacite forming lowest exposed lava flow below Rim Drive approximately 1 km (0.6 mi) south of Kerr Notch southeast of the caldera. Correlated with identical intrusive dacite (66% SiO_2) feeding lava at the top of Phantom Cone in the southeastern caldera wall.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Probably the same age as youngest **PEapn**, which has a K-Ar age of 346,000 ± 20,000 years ago.
	Regional volcanism, northwest; basaltic andesite west of Oasis Butte (PEbow)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Medium-gray porphyritic basaltic andesite lava near northwestern corner of map area.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism.
	Regional volcanism, southwest; basaltic andesite west of Bear Bluff, intrusive (PEbbi) and pyroclastic (PEbbp)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Medium-gray porphyritic olivine basaltic andesite (53%–54% SiO_2) necks and minor lava (**PEbbi**) and locally adhering grayish-red cinders (**PEbbp**) forming two low hills west of Bear Bluff in south-central part of map area.	Shield Volcanoes and Cinder Cones—northwest of Crater Lake caldera and roughly Crater Creek.	Regional Volcanism.
	Regional volcanism, southwest; basaltic andesite west of Mazama Campground (PEbcw)		Bacon (2008)	Medium-gray porphyritic basaltic andesite (55.5% SiO_2) lava. Named for exposures south-southeast of the caldera along east-facing scarp of Annie Springs fault south of Oregon Highway 62 and provisionally correlated outcrops north of where highway descends into drainage of Castle Creek.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. Possibly early or middle Pleistocene age.
QUATERNARY (Middle Pleistocene)	Mount Mazama; dacite of Mount Scott, lava (PEds), mudflow breccia (PEdsf), and pyroclastic (PEdsp)	Mount Mazama preclimactic eruption, dacite (Qmed)	Bacon (2008)	Porphyritic medium-gray dacite (63.5%–67% SiO_2; most 65% SiO_2) erupted from Mount Scott and related vents to east. Grades from pyroclastic breccia and agglutinate sheets high on Mount Scott itself to massive lava (**PEds**) distally. Related mudflow breccias (**PEdsf**) are locally preserved high on the northern side of Mount Scott; oxidized indurated cinder and agglutinate (**PEdsp**) marks a flank vent on the northeast.	Mount Mazama—along with **PEapn**, oldest lava assigned to Mount Mazama.	Buildup of Mount Mazama. K-Ar ages: 422,000 ± 10,000; 416,000 ± 7,000; and 355,000 ± 8,000 years ago.

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QUATERNARY (Middle? Pleistocene)	Mount Mazama; dacite of Cavern Creek (PEdcc)		Bacon (2008)	Finely porphyritic medium-gray dacite (64.5% SiO_2) lava exposed south-southeast of Mount Scott where Cavern Creek enters Pinnacle Valley and about 1 km (0.6 mi) to the west.	Mount Mazama—part of volcano edifice.	Buildup of Mount Mazama. Probably younger than **PErcc**, which has a K-Ar age of 724,000 ± 5,000 years ago.
QUATERNARY (Middle Pleistocene)	Mount Mazama; andesite of Phantom Cone; lava (PEapn) and intrusive (PEapni)	Mount Mazama preclimactic eruption, andesite (Qmea)	Bacon (2008)	Moderately porphyritic silicic andesite (60.5%–61.5, rarely 63.5% SiO_2) indurated near-vent fall deposits and lava flows (**PEapn**) and dikes and larger intrusions (**PEapni**) of Phantom Cone form approximately the lower half of the southeastern subaerial caldera wall adjacent to Phantom Ship. Phantom Ship island is composed of altered **PEapn** lava flows.	Mount Mazama—oldest lava of Mount Mazama exposed above lake level in caldera.	Buildup of Mount Mazama. K-Ar ages: 403,000 ± 12,000 years ago at lake level southeast of Phantom Ship; 346,000 ± 20,000 years ago at lake level at Kerr Notch.
	Regional volcanism, southwest; basaltic andesite of Whitehorse Creek; lava (PEbwc), intrusive (PEbwci), and pyroclastic (PEbwcp)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Medium-gray finely porphyritic basaltic andesite (53.5%–54.5% SiO_2) lava flows (**PEbwc**), palagonitic tuff (**PEbwcp**), and light-gray dike (**PEbwci**) north of Whitehorse Bluff and approximately 0.7 km (0.4 mi) east of Whitehorse Creek, southwest of the caldera. Dike forms 800-m- (2,630-ft-) long, north–south ridge of unnamed hill at elevation 1,854 m (6,082 ft).	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. K-Ar age of **PEbwci** sample of 1,379,000 ± 22,000 years ago appears to be inconsistent with field relations.
	Pre-Mazama volcanism; rhyodacite of Pothole Butte; felsite (PErpb) and vitrophyre (PErpbv)	East volcanism (Cascades), rhyodacite (Qer)	Bacon (2008)	Porphyritic light- to medium-gray and light-brownish-gray felsite (**PErpb**) and local dark-gray vitrophyre (**PErpbv**) (71.5%–73% SiO_2) lava domes and thick lava flows east and south of Mount Mazama. **PErpbv** is not mapped within Crater Lake National Park.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Pre-Mazama rhyodacite.	Pre-Mazama Volcanism. K-Ar ages: 468,000 ± 9,000 years ago (west of Sun Creek) and 448,000 ± 8,000 years ago (Pothole Butte).
	Pre-Mazama volcanism; rhyodacite south of Crater Peak (PErcs)		Bacon (2008)	Porphyritic light- to medium-gray and light-brownish-gray felsite and local dark-gray vitrophyre (71%–72% SiO_2) lava flows south of the caldera, west of Sun Creek, and south of Crater Peak. Phenocryst content and chemical composition distinguish **PErcs** from other pre-Mazama rhyodacites.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Pre-Mazama rhyodacite.	Pre-Mazama Volcanism. Estimated at 550,000–450,000 years old.
	Pre-Mazama volcanism; rhyodacite of Scott Creek (PErsc)	East volcanism (Cascades), rhyodacite (Qer)	Bacon (2008)	Porphyritic light- to medium-gray and light-brownish-gray felsite and local medium-dark-gray vitrophyre (68%–71.5% SiO_2) lava domes and lava flows east and south of Mount Mazama.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Pre-Mazama rhyodacite.	Pre-Mazama Volcanism. Estimated at 550,000–450,000 years old.
QUATERNARY (Middle? Pleistocene)	Regional volcanism, east; andesite of Sand Creek quarry (PEaq)	East volcanism, andesite (Qea)	Bacon (2008)	Porphyritic medium-gray olivine andesite (59% SiO_2) lava exposed at top of north–northeast-oriented down-to-the-east normal fault scarp from vicinity of Sand Creek to northern flank of low hill at elevation 1,652 m (5,420 ft), approximately 2.5 km (1.6 mi) south of Sand Creek Pinnacles; forms upper lava flow at Sand Creek quarry; also exposed in cut on Oregon Highway 232 at 1,555 m (5,100 ft) in elevation (southeastern corner of map area).	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park. Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism.
QUATERNARY (Middle Pleistocene)	Regional volcanism, southwest; andesite north of Castle Creek, lava (PEacc) and pyroclastic (PEaccp)	Southwest volcanism (Cascades), andesite (Qswa)	Bacon (2008)	Sparsely porphyritic medium-gray to medium-dark-gray andesite (58.5% SiO_2) lava flows (**PEacc**) on the ridge north of Little Castle and Castle Creeks and descending to Castle Creek near the western boundary of Crater Lake National Park; eroded cinder cone (**PEaccp**) forms highest point of the ridge.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. K-Ar age: 587,000 ± 18,000 years ago.
	Regional volcanism, east; andesite northeast of Annie Falls (PEaaf)	East volcanism (Cascades), andesite (Qea)	Bacon (2008)	Dark-gray porphyritic andesite (57.5% SiO_2) flow exposed at base of cliffs 1 km (0.6 mi) north–northeast of Annie Falls, south-central part of map area. Joint pattern suggests source north–northeast of outcrops.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 517,000 ± 15,000 years ago.

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QUATERNARY (Middle? Pleistocene)	Regional volcanism, east; basaltic andesite east of Cavern Creek (PEbep)	East volcanism (Cascades), basaltic andesite (QTeba)	Bacon (2008)	Grayish-red basaltic andesite (52.5% SiO_2) cinders and bombs locally exposed on eroded cinder cone east of Cavern Creek southeast of Mount Scott.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. Appears to be older than **PErsc**, which has a K-Ar age of 415,000 ± 11,000 years ago.
	Regional volcanism, east; andesite south of Sand Creek, lava (PEacs) and pyroclastic (PEacsp)	East volcanism, andesite (Qea)	Bacon (2008)	Sparsely porphyritic medium-gray hornblende andesite (61.5%–62.5% SiO_2) lava (**PEacs**) and cinders (**PEacsp**) poorly exposed on low hill at elevation 1,652 m (5,420 ft) marking vent approximately 2.5 km (1.5 mi) south of Sand Creek Pinnacles, southeastern part of map area.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism.
QUATERNARY (Middle? Pleistocene)	Regional volcanism, east; basaltic andesite east of Dry Butte (PEbdp)	East volcanism (Cascades), basaltic andesite (QTeba)	Bacon (2008)	Medium-dark-gray porphyritic basaltic andesite (56% SiO_2) bombs and grayish-red cinders locally exposed on small cinder cone approximately 4 km (2.5 km) east of Dry Butte near the southeastern edge of map area.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. Morphology suggests middle Pleistocene age.
	Regional volcanism, east; basaltic andesite of Boundary Butte (PEbap)		Bacon (2008)	Medium-dark-gray porphyritic basaltic andesite (53% SiO_2) agglutinate and grayish-red cinders exposed in upper part of Boundary Butte cinder cone in southeastern corner of map area.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. Morphology suggests middle Pleistocene age.
QUATERNARY (Middle Pleistocene)	Regional volcanism, east; andesite of Sun Creek (PEas)	East volcanism (Cascades), andesite (Qea)	Bacon (2008)	Porphyritic medium-gray andesite (62.5% SiO_2) lava cropping out at northeastern end of Sun Creek valley at elevation 1,890 m (6,200 ft), south of the caldera.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 623,000 ± 16,000 years ago.
	Pre-Mazama volcanism; dacite west of the Pinnacles (PEdw)	East volcanism (Cascades), dacite (QTed)	Bacon (2008)	Coarsely porphyritic medium-gray dacite (64%–65% SiO_2) lava domes west of the Pinnacles and at the western base of Maklaks Pass, southeast of the caldera.	Pre-Mazama dacite.	Pre-Mazama Volcanism K-Ar age: 612,000 ± 8,000 years ago below Maklaks Pass.
	Regional volcanism, east; basaltic andesite north of Lookout Butte (PEblp)	East volcanism (Cascades), basaltic andesite (QTeba)	Bacon (2008)	Medium-gray porphyritic basaltic andesite (53% SiO_2) lava and grayish-red cinders (**PEblp**) exposed on small cinder cone approximately 1 km (0.6 mi) north-northwest of Lookout Butte in northeastern corner of map area.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 605,000 ± 25,000 years ago.
	Regional volcanism, east; andesite west of Sand Creek (PEasw)	East volcanism, andesite (Qea)	Bacon (2008)	Sparsely porphyritic medium-dark-gray silicic andesite or low-silica dacite (62.5% SiO_2) lava cropping out in two places at western edge of valley of Sand Creek at approximately 1,860 m (6,100 ft) and 1,920 m (6,300 ft) in elevation, southeast of the caldera.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 670,000 ± 12,000 years ago.
	Regional volcanism, east; basaltic andesite east of Annie Falls (PEbaf)	East volcanism (Cascades), basaltic andesite (QTeba)	Bacon (2008)	Medium-gray porphyritic basaltic andesite lava flow(s) (52.5% SiO_2) forming canyon wall east of Annie Falls, south-central part of map area.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age: 651,000 ± 28,000 years ago.
	Pre-Mazama volcanism; rhyodacite west of Cavern Creek (PErcc)	East volcanism (Cascades), rhyodacite (Qer)	Bacon (2008)	Light-gray felsite and rare black obsidian of deeply eroded, poorly exposed lava dome of hill at elevation 2,015 m (6,610 ft) (73% SiO_2) and altered porphyritic light-gray felsite of eastern Anderson Bluffs (72.5% SiO_2) south of Mount Scott.	Pre-Mazama rhyodacite.	Pre-Mazama Volcanism. K-Ar age of dome 724,000 ± 5,000 years ago.
QUATERNARY (Middle or Early Pleistocene)	Regional volcanism, southwest; basalt of Castle Creek (PEbcc)	Southwest volcanism (Cascades), basalt (QTswb)	Bacon (2008)	Medium-gray porphyritic basalt (47.5% SiO_2) lava flows exposed in Castle Creek near confluence with Little Castle Creek.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism. Provisionally correlated with 1-million-year-old flows west of map area along Rogue River.

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QUATERNARY (Early Pleistocene)	Pre-Mazama volcanism; basaltic andesite of Bert Creek, mudflow (PEbbf)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Weathered monolithologic mudflow deposit (**PEbbf**) with clasts as large as 40 cm (16 in) underlying glacial till on high ground in northwestern corner of map. Associated with basaltic andesite lava flows (**PEbbc**).	None reported.	Regional Volcanism. Undated but overlies **PEbck**, which has a K-Ar age of 1,879,000 ± 22,000 years ago.
QUATERNARY (Early? Pleistocene)	Regional volcanism, southwest; basaltic andesite northwest of Little Castle Creek (PEbln)	Southwest volcanism (Cascades),basaltic andesite (Qswba)	Bacon (2008)	Medium-gray porphyritic basaltic andesite (54.5%–55.5% SiO_2) lava on northern wall of valley of Castle Creek west of confluence with Little Castle Creek, southwest of the caldera.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism.
QUATERNARY (Early Pleistocene)	Regional volcanism, southwest; basalt north of Castle Creek (PEbcn)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Medium-light-gray porphyritic basalt flows north of Castle Creek near western boundary of map (outside the park). Undated but overlain by unit PEacc, which has K-Ar age of 587,000 ± 18,000 years ago.	None reported.	Regional Volcanism.
	Regional volcanism, southwest; basaltic andesite of Castle Point (PEbac)	Southwest volcanism (Cascades),basaltic andesite (Qswba)	Bacon (2008)	Medium-gray sparsely porphyritic basaltic andesite (52.5%–54% SiO_2) of ridge below approximately 1,860 m (6,100 ft) in elevation, southwest of caldera and nearby lower part of canyon wall north of Castle Creek, approximately 1,585 m (5,200 ft) in elevation. Source vent probably was north of Castle Point.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek. Glacial Features—ridge of Castle Point is glaciated.	Regional Volcanism.
	Pre-Mazama volcanism; dacite of Sand Creek (PEdsc)	East volcanism (Cascades), dacite (QTed)	Bacon (2008)	Porphyritic medium-light- to medium-dark-gray dacite (65.5%–68% SiO_2) domes forming low hills between Sand Creek and Dry Butte near southeastern edge of map area.	Pre-Mazama dacite.	Pre-Mazama Volcanism. K-Ar age: 1,058,000 ± 16,000 years ago.
	Regional volcanism, east; andesite south of Dry Butte (PEadsi)	East volcanism, andesite (Qea)	Bacon (2008)	Medium-gray porphyritic andesite (57% SiO_2) of plug and minor flows exposed on northeastern flank of hill immediately south of Dry Butte, southeastern part of map area.	Shield Volcanoes and Cinder Cones—east of the longitude of Munson Valley and park headquarters.	Regional Volcanism. K-Ar age 1,088,000 ± 13,000 years ago.
	Pre-Mazama volcanism; basaltic andesite of Bert Creek, lava (PEbbc)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Bacon (2008)	Dark-gray finely porphyritic basaltic andesite lava flows (**PEbbc**) underlying glacial till on high ground in northwestern corner of map. Distinguished from underlying basalt flows by abundant conspicuous plagioclase. Associated with mudflow deposit (**PEbbf**).	None reported.	Regional Volcanism. Undated but overlies unit **PEbck**, which has K-Ar age of 1,879,000 ± 22,000 years ago.
	Pre-Mazama volcanism; dacite of Dry Butte (PEdd)	East volcanism (Cascades), dacite (QTed)	Bacon (2008)	Porphyritic light-greenish-gray hornblende dacite (63% SiO_2) of poorly exposed domes near southeastern edge of map area that form Dry Butte.	Pre-Mazama dacite.	Pre-Mazama Volcanism. K-Ar age: 1,275,000 ±14,000 years ago.
	Regional volcanism, northwest; basaltic andesite north of Crater Creek (PEbck)	East volcanism (Cascades), dacite (QTed)	Bacon (2008)	Medium-gray sparsely porphyritic basaltic andesite flows underlying the bulk of the high area in the northwestern corner of the map area between the drainages of Crater and National creeks and bounded on the east by fault-line scarp. May contain flows of differing ages and source vents.	None reported.	Regional Volcanism. K-Ar age: 1,879,000 ± 22,000 years ago.

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QUATERNARY (Pleistocene)	Mount Mazama; submerged outcrops of the caldera walls, undivided (PEsu)	Submerged caldera walls (scw)	Bacon (2008)	Bedrock outcrops submerged below the surface of Crater Lake. Have not been correlated with exposed map units.	Slope Movements—some of the deeper outcrop areas may be large slump blocks. Mount Mazama—part of Mount Mazama edifice. Crater Lake Caldera and Fill, Bathymetic Data—revealed during 2000 survey.	Buildup of Mount Mazama and pre-Mazama volcanism.
	Glaciogenic deposits (PEgd)	Glacial deposits (Qg)	Sherrod (1991)	Till and outwash deposited during Pleistocene glacial advances, divided into Drift—stratified and unstratified deposits (mostly till) that form ground, lateral, and terminal moraines. Includes minor alluvium where reworked by streams. Grades upslope into talus and colluvium. Outwash—poorly to moderately sorted, unconsolidated to well-consolidated sand and gravel that form terraces along North Umpqua River, and Salmon and Hills creeks. Locally overlain by late Pleistocene lava flows.	Glacial Features—till and outwash deposits.	Chiefly Wisconsinan (late Pleistocene) but may include older deposits.
QUATERNARY (Pleistocene)	Older basaltic andesite (PEoba)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Sherrod (1991)	Lava flows and breccia petrographically similar to younger basaltic andesite (**Qyba**) but associated with moderately eroded vents or not assignable to a particular vent. Divided into older basalt (**PEob**) and older andesite (**PEoa**).	None reported.	Regional Volcanism. Mostly younger than 730,000 years old.
	Older basalt (PEob)	Northwest volcanism (Cascades), basalt (QTnwb)	Sherrod (1991)	Lava flows and breccia similar to older basaltic andesite (**PEoba**) but of basaltic composition.	None reported.	Regional Volcanism. Mostly younger than 730,000 years old.
	Older andesite (PEoa)	Northwest volcanism (Cascades), andesite (QTnwa)	Sherrod (1991)	Lava flows and breccia similar to older basaltic andesite (**PEoba**) but of andesitic composition.	None reported.	Regional Volcanism. Mostly younger than 730,000 years old.
QUATERNARY-TERTIARY (Holocene? to Pliocene)	Mafic vent deposits (QTmv)	Cascades volcanism, mafic vent deposits (QTcmvd)	Sherrod (1991)	Poorly to well-bedded, thin- to very thick-bedded tuff, lapilli tuff, and tuff breccia ranging from basalt to basaltic andesite. Comprises chiefly red to black cinders and agglutinate, yellow to brown palagonitic tuff, lesser lithic breccia, and minor lava flows and intrusions.	None reported.	Regional Volcanism. Pliocene, Pleistocene, and late Holocene (?), as inferred from age of adjacent lava flows (e.g., **QTba**, **Qoba**, and **Qyba**).
QUATERNARY -TERTIARY (Pleistocene or Pliocene)	Regional volcanism, southwest; basaltic andesite, undivided, lava (QTb)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Light- to dark-gray variably porphyritic basaltic andesite lava flows.	None reported.	Regional Volcanism.
QUATERNARY-TERTIARY (Pleistocene or Pliocene)	Regional volcanism, southwest; basaltic andesite of Union Creek, lava (QTbuc) and intrusive (QTbuci)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Bacon (2008)	Medium-gray to brownish-gray porphyritic basaltic andesite (52%–55% SiO_2) lava flows (**QTbuc**; locally includes cinders north of Rocktop Butte) and intrusive rock (**QTbuci**) near the headwaters of Union Creek in southwestern corner of map area. Consists mainly of lavas and intrusive core of dissected Rocktop Butte volcano but also includes related (?) intrusion of south-facing slopes northwest of Varmint Creek; dike near hill at elevation 1,771 m (5,811 ft), 1.1 km (0.7 mi) southeast of Varmint Camp; and patch of diktytaxitic basalt at 1, 646 m (5,400 ft) in elevation, 1.0 km (0.6 mi) south of Varmint Camp.	Shield Volcanoes and Cinder Cones—southwest of Crater Lake caldera and roughly Annie Creek.	Regional Volcanism.

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QUATERNARY-TERTIARY Pleistocene and Pliocene)	Basaltic andesite (QTba)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Smith et al. (1982); Sherrod (1991)	Slightly to moderately porphyritic lava flows and breccia west of Crater Lake National Park and at Garwood Butte. Includes minor basalt and andesite. Lava at Garwood Butte is chiefly basaltic andesite and has blue-gray microvesicular olivine and olivine-bearing flows forming deeply eroded coalescing shield volcanoes along the crest of the Cascade Range.	None reported.	Regional Volcanism. K-Ar age of 1,870,000 ± 60,000 years ago.
	Mafic intrusive rocks (QTmi)	Southwest volcanism (Cascades), basaltic andesite (Qswba)	Smith et al. (1982)	No description provided.	None reported.	Regional Volcanism.
	Intrusive rocks (QTi)	Cascades volcanism, intrusive rocks and dikes (QTcin)	Sherrod (1991)	Plugs of basalt, basaltic andesite, and andesite, chiefly conduit-filling necks and shallow intrusions of volcanoes. Volcanoes younger than about 250,000 years old are only slightly eroded, and their intrusions are not exposed.	None reported.	Regional Volcanism. Pliocene and Pleistocene in age, as inferred from surrounding lava flows (**QTba** and **Qoba**) that are cut or fed by intrusions.
QUATERNARY-TERTIARY	Basaltic andesite of Boundary Butte (QTbdy)	East volcanism (Cascades), basaltic andesite (QTeba)	Jenks et al. (2008)	Massive basaltic andesite.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park.	Regional Volcanism.
TERTIARY (Pliocene)	Basalt of Copeland Canyon (Tcop)	East volcanism (Cascades), basalt (QTeb)	Jenks et al. (2008)	No unit description provided.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park.	Regional Volcanism.
	Dacite (Tdac)	East volcanism (Cascades), dacite (QTed)	Jenks et al. (2008)	Thinly layered dacite.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park.	Regional Volcanism.
	Basaltic andesite of Wood River Spring (Twod)	East volcanism (Cascades), basaltic andesite (QTeba)	Jenks et al. (2008)	No unit description provided.	Hydrothermal Features and Geothermal Development—exploration east of Crater Lake National Park.	Regional Volcanism.
TERTIARY (Pliocene and Miocene)	Diatomite and volcaniclastic sediments (Td)	Diatomite and volcaniclastic sediments (Tdvs)	Smith et al. (1982)	Flat-lying lake beds and deltaic beds in the upper Rogue River Valley.	None reported.	None reported.
TERTIARY (Pliocene and upper Miocene)	Volcanic rock of the High Cascade Range, basalt (Tb)	Southwest volcanism (Cascades), basalt (QTswb)	Smith et al. (1982)	Fine-grained high-alumina olivine basalt flows and deeply incised coarse-grained diktytaxitic olivine basalt flows. Forms subdued and greatly eroded shields. Areas underlain by this unit are generally covered by thick clay-rich red soils.	None reported.	Regional Volcanism.
	Volcanic rock of the High Cascade Range; basaltic andesite (Tba)	Southwest volcanism (Cascades), basaltic andesite (QTswba)	Smith et al. (1982)	The most common lithology is light-blue-gray fine-grained high-alumina olivine basaltic andesite. Occurs as large deeply eroded coalescing shield volcanoes, interbedded cogenetic near-vent pyroclastic deposits, and extensive valley-filling flows.	None reported.	Regional Volcanism.
	Volcanic rock of the High Cascade Range; andesite (Ta)	Southwest volcanism (Cascades), andesite (QTswa)	Smith et al. (1982)	Mostly pyroxene andesite, but contains rocks with a variety of textures and mineralogies. Occurs as deeply eroded large composite volcanoes, steep-sided shields, smaller vent areas, and extensive valley-filling flows.	None reported.	Regional Volcanism.

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TERTIARY (Pliocene and upper Miocene)	Volcanic rock of the High Cascade Range; intermediate intrusive rocks (Tii)	Southwest volcanism (Cascades), andesite (QTswa)	Smith et al. (1982)	No unit description provided.	None reported.	Regional Volcanism.
	Mafic vent deposits (Tmv)	Cascades volcanism, mafic vent deposits (QTcmvd)	Sherrod (1991)	Near-vent tuff, lapilli tuff, and tuff breccia of basalt and basaltic andesite volcanoes.	None reported.	Regional Volcanism. Similar to younger basaltic vents (**QTmv**) but early Pliocene and older in age, as inferred from adjacent or overlying strata.
TERTIARY (Miocene)	Basalt and andesite of Western Cascades; basalt (Twb)	Northwest volcanism (Cascades), basalt (QTnwb)	Sherrod (1991)	Basalt lava flows and breccia of slightly porphyritic basalt and basaltic andesite.	None reported.	Regional Volcanism.
	Basalt and andesite of Western Cascades; andesite (Twa)	Northwest volcanism (Cascades), andesite (QTnwa)	Sherrod (1991)	Andesite lava flows and breccia of slightly porphyritic two-pyroxene andesite and minor amounts of basaltic andesite, hornblende andesite, dacite, and quartz-bearing rhyodacite or rhyolite. Includes some tuff, tuff breccia, and lapilli tuff.	None reported.	Regional Volcanism.
	Basalt and andesite of Western Cascades; tuffaceous volcaniclastic rocks (Twt)	Northwest volcanism (Cascades), basaltic andesite (QTnwba)	Sherrod (1991)	Thin- to very thick-bedded debris- and pyroclastic-flow deposits, tuffaceous sandstone, and breccia. Includes minor interbedded andesite lava flows. Pyroclastic flows are predominantly intermediate and silicic in composition.	None reported.	Regional Volcanism.
TERTIARY (Miocene and Oligocene)	Little Butte volcanics; andesite (Tla)	Northwest volcanism (Cascades), andesite (QTnwa)	Sherrod (1991)	Predominantly tuffaceous volcaniclastic rocks (chiefly andesite to rhyodacite in composition), fewer andesite lava flows, and minor basalt lava flows and silicic domes.	None reported.	Regional Volcanism. Lower part of sequence mostly younger than 24 million years old. Regionally, oldest part of the Little Butte volcanics is about 35 million years old. K-Ar ages near top of section are about 19 million–17 million years old.