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(rarely to 20 m), commonly displaying prismatic jointing. Lithology: mildly vuggy dacite with 2-3 percent phenocrysts (1-1.5 mm diameter), with plagioclase more abundant than hornblende, and hypersthene in about the same abundance as hornblende; in seriate, granular, fine-grained groundmass. Contains notably abundant medium- to coarse-grained gabbro inclusions. On upper surface of unit many roots of trees and shrubs remained after the 1980 eruption, indicating relatively little erosion by the blast and avalanche. Blocks exposed on upper surface are abraded, striated, and broken by passage of the 1980 debris avalanche. Unit was probably largely deposited as pyroclastic flows (dome-collapse block and ash-flows) and minor talus shed from Goat Rocks dome (destroyed in the 1980 debris avalanche). Forms surface west of Step creek. This surface is locally covered by scattered pumice blocks (not mapped) of unit f. Unconformably overlies lavas and breccias of the Castle Creek eruptive period. In northwestern part of map area this contact

to bottom; see table 1): 25 cm tephra unit X of Kalama eruptive period

35 cm lahar composed of mixed andesite and rhyodacite clasts (rhyodacite derived from rocks of Sugar Bowl eruptive period) 25 cm mafic tephra of Castle Creek eruptive period

a typical section contains: cm in diameter 20-cm-thick lithic concentration in the tephra 60-cm-thick lapilli tephra

Divisions between layers are gradational. Lapilli and small blocks

range from 0.5–10 cm in diameter with a few outsized pumice clasts. Pumice is white, angular; heavy mineral separates include hornblende, which is more abundant than hypersthene, and minor augite. Many large pumice clasts have pink oxidized interiors. Lithic clasts are angular and consist of andesite, basalt, and dacite (including summitdome dacite: light-gray sugary groundmass; phenocryst-poor low-silica dacite with about 0.5 percent hornblende needles as long as 7 mm; fracture surfaces commonly have a pink to reddish-brown patina). Overlies lahar unit (unit kl) of the Kalama(?) eruptive period and underlies pyroclastic fan deposits (unit gp) of the Goat Rocks eruptive period. Unit deposited in 1800 (Yamaguchi, 1983). Thickness 0–8 m Deposits of Kalama(?) eruptive period (A.D. 1480-1630)

Lahar and fluvial deposits (Quaternary)—Variably colored darkto light-gray fragmental deposits. Crudely stratified unit of alternating clast- and sandy matrix-supported textures. Poorly sorted with clasts as large as 2.5 m in diameter and heterolithologic (including summitdome dacite); equant and subangular to subrounded. Unit occurs as remnants of sedimentary fill in paleovalleys incised into lavas of the Castle Creek eruptive period surrounding Loowit creek. Unconformably overlain by tephra layer T (unit t) of the Goat Rocks eruptive

Deposits of Kalama eruptive period (A.D. 1480-1630)

Thickness 0–5 m Pyroclastic-surge and minor blast deposits of May 18, 1980 (and younger?) (Quaternary)—Surge deposits are tan lapilli tuff, which is laminated and cross bedded and in places forms Thickness 50 m large dunes. Lapilli are as much as 3 cm in diameter, consisting of lithic fragments and dacite pumice. Surge deposits are probably

ashy matrix. Thickness 0-8 m Pyroclastic-flow deposits from May 18, 1980, and later (Quaternary)—Light-colored (white, tan, and pink), poorly sorted, block, lapilli, and ash deposits (mostly pumiceous). Individual flow units 0-8 m thick, channel-filling, commonly reversely graded, clast supported at top and matrix supported below. Lithic-block lag deposits are common at bases of flow units. Flow unit deposited on July 22 has a pink or brown oxidized upper zone, which forms a resistant horizon in southern part of map area. Pumice clasts are subrounded, dacitic; lithic clasts are mostly porphyritic dacite, commonly with breadcrust surface or prismatic jointing, but also include accidental andesitic or other dacitic lithologies. Unit best exposed along stream cuts in upper and middle parts of the Sasquatch Steps. Locally includes May 18, 1980, blast deposit (recognized by the abundance of blue-gray "blast dacite"). Unit grades laterally to laminated, lapilliash surge deposits (unit s) on steep slopes of east and west sides of the Sasquatch Steps. Also contains minor laharic deposits. Formed

16–18 eruptions. Thickness 0–25 m Debris-flow deposit of June 4-July 18, 1980 (Quater**nary**)—Medium-gray, massive, tabular deposit, very poorly sorted, matrix-supported diamict. Basal 0.5 m is medium-brown, well-sorted lithic ash that grades upward into massive, blocky upper part. Clasts are irregularly shaped, subrounded to angular, and range in size from coarse ash in the matrix to blocks as large as 2 m in diameter (3 m in the westernmost exposures). Clasts are monolithologic, frothy, gray porphyritic dacite with extremely rough, friable exteriors; locally flow banded and contain about 10 percent phenocrysts of plagioclase and lesser hornblende, 1-5 mm in diameter. Also contains localized, shattered, irregular-shaped blocks of orange-brown, oxidized, aphyric and phenocryst-rich andesites. This unit probably resulted from a debris flow initiated in deposits of the Kalama eruptive period in the northwest crater wall. Located on the upper and middle Sasquatch Steps. Typically in sharp contact with underlying unit av; locally overlies units p and pkd. Unit d did not exist on June 4, 1980 (photo by Sandia Labs, #201), but had been emplaced by July 18, 1980

during May 18, May 25, June 12, July 22, August 7, and October

CORRELATION OF MAP UNITS

Unconformity

Unconformity

gp

Unconformity

Unconformity kl ka

Unconformity

Unconformity

руа

DESCRIPTION OF MAP UNITS

Alluvium (Quaternary)—Stream deposits, minor lahars, and talus.

Ice (Quaternary)—Permanent or long-lasting ice fields. Confined to

Talus (Quaternary)—Contains minor alluvium. Deposited after May

Lahar deposits (Quaternary)—Unconsolidated to moderately

consolidated, poorly sorted, crudely stratified, massive to lensoidal-

bedded gravel and sand. Clasts are lithic and pumiceous hetero-

geneous rock types, subangular, as large as 1 m in diameter, matrix

supported, and set in a medium-gray, silty to sandy lithic groundmass;

commonly contains blocks of gray, porphyritic, prismatically jointed

dacite (largely derived from the 1980–86 lava dome). Unit interfingers

with, but is mostly younger than, unit f. Unit deposited after May 18,

1980; much of the unit probably deposited on March 19, 1982.

mostly younger than the May 18, 1980, blast deposits. On top of Sugar Bowl dome, unit consists only of the May 18 blast deposit,

recognized by abundant lapilli and blocks of light blue-gray dacite in

deep stream cuts of upper Step creek. Deposited after May 18, 1980.

Includes rapidly accumulating fan at north margin of Sasquatch Steps.

Deposits formed during and since A.D. 1980

Thickness 0-7 m

18. 1980. Thickness unknown

Deposited after May 18, 1980. Thickness unknown

OUATERNARY

(photo by M. Doukas, Cascades Volcano Observatory: D-80.06.1). Thickness 0–9 m Pumiceous pyroclastic-flow deposit (Quaternary)—White, lensoidal-shaped deposit. Consists of two flow units, each about 2.5 m thick, separated by indistinct subhorizontal contact. Both flow units are massive, poorly sorted lapilli-ash deposits. Locally, lowest 10 cm is laminated coarse lithic-pumiceous ash, overlying a lithic ash bed. Lapilli are largely rounded pumice, as much as 20 cm in diameter in lower flow unit, 2 cm in upper unit; with a few lithics clasts of varying lithologies (glassy and porphyritic dacites, vesicular andesites). Lapilli are supported in a matrix of lithic-pumiceous ash. Locally contains minor mafic-lithic lahar deposits below unit d. Localized in southwestern part of the Sasquatch Steps. Sharp contacts with both underlying unit av and overlying unit d. Distinguished from unit f by presence of overlying unit d; where unit d was not deposited, unit p

may be mapped as part of unit f. Unit deposited on May 18, May 25, or June 12, 1980. Thickness 0–5 m Debris-avalanche deposit of May 18, 1980 (Quaternary)—Dark-brown, gray, yellow, reddish-brown, and green diamict composed of various rock types found in present crater walls. Unit contains blocks ranging from cobble size to more than 100 m in diameter supported by very poorly sorted matrix of silt to pebble size. Blocks are internally shattered and many large blocks contain relict, contorted contacts between differing rock types. Unit is wholly lithic, predominantly composed of various andesites, minor basalts, and minor phyric and aphyric dacites. Surfaces of many clasts are noticeably gouged. Surface character is hummocky, with mounds ranging from pointed-conical to extremely elongate downslope. Emplacement of the avalanche left underlying surfaces striated and locally polished. Striations are best displayed in lower Sasquatch Steps on surfaces of units gp, cb, and cab. Passage of avalanche over poorly consolidated units gp and cab appears not to have significantly plucked or quarried loose blocks; instead fracturing, planing, striating, and polishing their upper surfaces. Thickness 0-95 m

Deposits of Goat Rocks eruptive period (A.D. 1800-1857) Pyroclastic-fan deposits derived from Goat Rocks dome (Quaternary)—Poorly sorted, reversely graded, light- to mediumgray dacite (appears to darken up-fan) block, lapilli, and ash layers 1-3 m thick, commonly separated by gray lithic ash beds 2-30 cm thick. Blocks are sub-rounded, generally as large as 3 m in diameter contains a thin interbedded sequence consisting of (described from top

10 cm tephra unit W of Kalama eruptive period

Bottom 10 cm of ash and lapilli

Unit deposited during the 1840's and 1850's. Thickness 0-35 m **Tephra layer T (Quaternary)**—Pumice and lithic lapilli tephra. Mantle-bedded, multiple-layer tephra is clast supported (with about 10 percent ash-size fraction), reversely graded, and loosely consolidated; Upper 2 m: lapilli tuff with scattered pumice blocks as large as 30

period. Thickness 0–30 m

Andesite breccia (Quaternary)—Black to dark-gray, poorly sorted breccia with clasts as large as 60 cm in diameter. Lithology ranges from porphyritic (with plagioclase phenocrysts much more abundant than hypersthene) to aphyric, glassy varieties. Difficult to distinguish from unit cab. Overlies the Sugar Bowl rhyodacite dome (unit sb) and deposits of the Castle Creek eruptive period (units cb, cab) in eastern part of map area. Overlies 20-cm-thick, white pumice lapilli tephra (probably tephra set W of the Kalama eruptive period; with mafic crystals of hypersthene more abundant than hornblende) in west fork of Step creek. hickness 0–50 m

Dome of Sugar Bowl eruptive period (A.D. 800) Sugar Bowl dome (Quaternary)—Medium-gray, massive, blocky

hyodacite. Mildly frothy porphyritic rhyodacite with 10-15 percent phenocrysts (0.5–1.5 mm in diameter) of plagioclase, hypersthene, and hornblende in very fine-grained microcrystalline groundmass. Deposits of Castle Creek eruptive period (2,200-1,700 B.P.)

andesite lava and breccia; rare low-silica andesite. Form tabular lava flows, 1–7 m thick, of medium- to dark-gray, mildly vesicular pahoehoe and aa with common reddish-brown scoriaceous, brecciated bases and tops. Lithology: seriate texture with fine-grained pilotaxitic groundmass and 1-15 percent phenocrysts (0.5-2.0 mm in diameter) of plagioclase, olivine, and commonly augite. Phenocryst-poor varieties contain olivine only as groundmass phase. Unconformably overlies andesitic lavas and breccias of the Castle Creek eruptive period. Basaltic breccias largely overlie basaltic lavas, locally grade into dense lava, and are probably autoclastic basaltic flow breccias, subordinate lahars, and talus. Thickness 0-60 m Basalt dikes (Quaternary)—Black to dark-brown, anastomosing tabular to lensoidal dikes, locally columnar jointed. Lithology: 10-15 percent phenocrysts (0.5-1.5 mm in diameter) of plagioclase and

olivine, in a fine-grained pilotaxitic groundmass. Locally, mildly

vesicular. Local, irregular reddish-brown and yellow alteration enve-

lopes (baked zones) as thick as 4 m developed in host rocks adjacent

to dikes. Intrude Kid dome (unit pkd) and Northeast dome (unit pnd) of

the Pine Creek eruptive period as well as andesite dikes (unit cad) of

Basalt and basaltic andesite (Quaternary)—Basalt and basaltic

Andesite breccias (Quaternary)—Black to dark-gray, tabular to lensoidal, fragmental beds, 2–10 m thick; common lenticular ashy interbeds. Beds are massive to normally graded, clast supported or supported in about 10-15 percent ash and lapilli matrix. Clasts are subangular to subrounded, dense or vesicular, glassy, monolithologic, range from 10 cm to 1 m in diameter, and are rarely prismatically jointed. Overlies and interfingers with andesite lavas (unit ca) and is unconformably overlain by basalt lavas (unit cb); upper contact locally marked by section of laminated intermediate or mafic ash as thick as 2 m. Breccias locally grade into dense lava interiors and are probably autoclastic andesitic flow breccias and, possibly, subordinate lahars. Thickness 0–95 m

the Castle Creek eruptive period. Dikes are 0-3 m thick

Andesite lava and minor flow breccias (Quaternary)—Mediumto dark-gray flows 7-15 m thick, with reddish-brown autobrecciated flow tops and bases; flow interiors dense with common platy fracturing. Lithology: porphyritic with fine-grained trachytic or pilotaxitic groundmass containing 5-20 percent phenocrysts of plagioclase, augite, commonly hypersthene, and rare olivine; an atypical vesicular, plagioclase-phenocryst-rich variety of this unit occurs locally at base of unit, possibly correlative with unit cba. Overlies dacite domes and fragmental units of the Pine Creek eruptive period. Interfingers with and overlain by unit cab. In the lowermost Loowit creek exposure a charred log in the basal part of the lowest andesite lava yielded an age of 1,940±90 ¹⁴C yr B.P. (sample W6221, table 2). This lava overlies the following section: Castle Creek 10 cm laminated mafic ash

eruptive period 15 cm plagioclase phyric andesite lahar ---- 2.5 m interlayered dacite and andesite tephras Pine Creek 60 cm laminated lithic dacite lapilli flowage eruptive period deposit. Carbonized leaf and bark debris from

the basal part of deposit yielded an age of 2,840±90 ¹⁴C yr B.P. (sample W6222, table 2) 6 cm pink dacite ash Section overlies diamicts (unit poa). Unit ranges from 0 to 50 m thick Andesite dikes (Quaternary)—Black, mildly vesicular tabular dikes. Dikes have thin chilled margins. Lithology: porphyritic texture with fine-grained hyalopilitic groundmass. About 5 percent phenocrysts (1–3 mm in diameter) of plagioclase, augite, and hypersthene. Intrude Kid dome (unit pkd) and intruded by basalt dikes (unit cbd) of the Cas-

tle Creek eruptive period. Dikes are 1-4 m thick Basaltic andesite cinder, agglutinated spatter, and lava (Quaternary)—Red to black scoriaceous to dense lapilli, block, and lava deposit. Lithology: 5–10 percent phenocrysts (0.5–3 mm in diameter) of plagioclase, augite, and olivine, in a very fine grained, mafic-rich felted matrix. Eroded cinder cone in southwestern part of map area. Overlies Kid dome (unit pkd). Thickness 0–30 m Deposits of Pine Creek eruptive period (3,000-2,500 B.P.)

Younger debris-avalanche deposit (Quaternary)—Variegated light-gray and pastel yellow, pink, and green, unconsolidated mixture of relatively fresh to strongly altered (hydrothermally?) lithic dacite blocks, lapilli, and ash. These lithic clasts are all porphyritic and include dacite with plagioclase, hornblende, and hypersthene and minor dacite with plagioclase, hornblende, and quartz. Deposit contains a few large, contorted, stratified masses of block and ash-flow deposits but is largely massive. Cut by numerous shallowly to mod-

erately inclined shear surfaces. Basal part of deposit is zone 0-3 m thick that contains abundant uncharred and battered logs; logs are commonly surrounded by a soft, yellowish-brown, sandy to clayey deposit that may be an intermixed paleosoil. Log in the lowermost part of unit yielded age of 2,590±120 ¹⁴C yr B.P. (sample W6032, table 2). Thickness 0–65 m Pyroclastic-flow deposits (Quaternary)—Lithic, rarely pumiceous, dacite block and ash-flow deposits. Light-gray, tabular-bedded flow units; each flow unit about 10 m thick; reversely (rarely normally) graded; poorly sorted with common light-pink oxidized flow tops. Subangular, dense to mildly frothy, monolithologic dacite clasts as large as 2 m in diameter; some units have common prismatically jointed blocks. Blocks are supported in matrix of coarse lithic ash and lapilli. Lithology: porphyritic dacites with plagioclase, hypersthene, and hornblende. Lithic clasts in upper 1.5 m of unit locally display

> intense internal shattering where overlain by unit pya. Unconformably overlies dacite domes of the Pine Creek eruptive period and the older (unit poa) of two Pine Creek-age debris avalanche deposits. Thickness Older debris-avalanche deposit (Quaternary)—Variegated lightgray and pastel yellow, pink, and green, unconsolidated mixture of relatively fresh and strongly altered (hydrothermally?) lithic dacite blocks, lapilli, and ash. Clasts are all porphyritic and include dacite with plagioclase, hypersthene, and hornblende; dacite with plagioclase, hornblende, quartz, and biotite; and dacite with plagioclase, hornblende, and cummingtonite. The deposit contains a few large stratified masses of block and ash-flow deposits but is largely massive. Numerous shallowly to moderately inclined shear surfaces cut the section; many of these display cataclastic shear texture. Uppermost part of unit in lower Step creek canyon is an atypical reddish-brown contorted dacite breccia layer that displays a hummocky top where unconformably overlain by pyroclastic flow deposits (unit pp) of the

GEOLOGIC INVESTIGATIONS SERIES

Map I-2463

pyroclastic flow deposits (unit pp) of Pine Creek-age. Thickness 0-40 m, base not exposed Breach dome (Quaternary)—Medium-gray to pink strongly shattered dome. Lithology: vuggy, porphyritic dacite with fine-grained granular groundmass containing 20–30 percent phenocrysts (0.5–2 mm in diameter) of plagioclase, hornblende, and hypersthene.

Pine Creek eruptive period. Locally, may include undisturbed

Thickness 175 m Kid dome (Quaternary)—Light-gray dacite. Strongly shattered. Erodes to badland topography. Lithology: porphyritic dacite with finegrained granular groundmass containing about 20 percent phenocrysts (0.5-4 mm in diameter) of plagioclase, hornblende, and hypersthene (hypersthene displays unusually high interference colors, up to second order blue in thin section, indicating a relatively high iron content). Unconformably overlain by the Breach dome (unit pbd), pyroclasticflow deposits (unit pp) of the Pine Creek eruptive period, and andesite lavas and cinder deposits (units ca, cba) of the Castle Creek eruptive period. Intruded by Castle Creek-age andesite and basalt dikes (units

cad, cbd). Thickness 175 m, base not exposed Northeast dome (Quaternary)—Light-gray dacite. Strongly shattered. Erodes to badland topography. Similar in outcrop appearance and lithology to Kid dome (unit pkd) and is, perhaps, correlative with it. Unconformably overlain by andesite breccias (unit cab) of the Castle Creek eruptive period and intruded by Castle Creek-age basalt dikes (unit cbd). Thickness 100 m, base not exposed

Domes of Smith Creek eruptive period (4,000-3,300 B.P.) Archybacter dome (Quaternary)—Medium-gray dacite. Strongly shattered. Lithology: porphyritic texture with fine-grained granular groundmass containing 20 percent phenocrysts (0.5-2 mm in diameter) of plagioclase and hornblende; minor cumminatonite identified in a heavy mineral separate. Overlain by basalt lavas and andesitic breccias (units cb, cab) of the Castle Creek eruptive period, as well as pyroclastic-flow deposits (unit pp) of the Pine Creek eruptive period. Thickness 50 m, base not exposed

Loowit dome (Quaternary)—Light-gray, highly fractured dacite. containing 40 percent phenocrysts (0.5–2.0 mm in diameter) of plagioclase, hornblende, and altered cummingtonite(?); with a trace of biotite. Fractures are mostly randomly oriented. In lower exposures, one major fracture set is sub-horizontal and wavy in form. Exposed along Loowit creek, at and below Loowit falls. Overlain by basalt lavas (unit cb) of the Castle Creek eruptive period. Thickness 115 m, base not

 Contact—Dashed where approximately located. Showing dip where known Fault—Dashed where approximately located. Bar and ball on downthrown side. Showing dip where known. Arrows on faults in cross section show relative sense of movement

Thrust fault—Sawteeth on upper plate. Showing dip where known Orientation of scoured grooves and striations produced during the debris-avalanche of May 18, 1980

Strike and dip of inclined layering or dike orientation Horizontal layering Hot spring

Geochemical sample locality—Number refers to table 3 • Radiocarbon-dated sample locality—Number refers to table 2

INTRODUCTION

The 1980 eruption of Mount St. Helens resulted in both new volcanic deposits

and deeply incised exposures into pre-1980 deposits. These exposures were pro-

duced by excavation of the crater by the 1980 landslides and lateral explosion as well as the subsequent erosion of Step and Loowit creeks by northerly stream flow out of the horseshoe-shaped crater. The map covers the area known as the Sasquatch Steps (commonly called the Steps), which lies between the Pumice Plain on the north and the lowermost portion of the crater on the south. Rapid alluvial aggradation at the base of the Steps is presently burying some of the lowest exposures, and erosion is stripping many of the upland deposits. The stratigraphic sequence exposed in the map area includes deposits from the eruptive periods listed in table 1 (Crandell, 1987). Assignment of deposits to the various eruptive periods is based on lithology and erromagnesian-mineral suites typical for each of the eruptive periods (Mullineaux and Crandell, 1981; Mullineaux, 1986), as well as three ¹⁴C dates from wood found in Faults displayed on the map are largely confined to the older part of the stratigraphic section. These older units are highly shattered, with an extremely complicated fracture pattern, and it is only possible to show the largest and most distinctive of these structures at the map scale. Interpretation of the stratigraphy and structure of this area is given in Hausback

The following nomenclature is used in compositional classification of volcanic Percent SiO₂ 68-72 Rhyodacite 62-68 Dacite 57-62 Basaltic andesite 52-57

rock types:

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Table 3. Chemical analyses of samples from Sasquatch Steps area, Mount St. Helens, Washington

[Analyses by S. Pribble, J. Taggart, A. Bartel, D. Siems; U.S. Geological Survey] Map No. 87-1 87-3 87-6 87-9 87-10 87-16 87-18 87-19 87-20 87-23 87-24 87-27 88-1 Map No. 88-38 88-44 88-45 88-46 88-47 88-48 88-51 88-52 88-53 88-54 88-55 88-56 88-57 TOTAL 99.89 100.03 100.02 100.52 100.03 99.73 101.09 100.66 101.00 100.10 100.24 100.83 101.07 Map No. 88-14 88-16 88-17 88-18 88-19 88-24 88-28 88-30 88-32 88-34 88-35 88-36 88-37 $_{5}0_{5}$ 0.17 0.18 0.15 0.37 0.16 0.19 0.28 0.14 0.03 0.17 0.29 0.39 0.16 TOTAL 100.49 99.76 99.87 100.43 100.11 99.52 100.49 99.74 100.69 100.19 100.51 100.19 99.78 TOTAL 99.83 100.89 100.12 100.76 100.19 101.14 99.68 100.04 100.49 100.73 99.59 101.44 100.24 Analyses courtesy of Fraser Goff, Los Alamos Laboratories **Table 3, cont.** — *List of analyzed samples* **Table 3, cont.** — List of analyzed samples, cont pp Dacite clast from Pine Creek-age dacite pyroclastic flow Smith Creek(?)-age dacite of Loowit dome gp Dacite clast from Goat Rocks-age pyroclastic flow 88-44 ca Castle Creek-age andesite June 4-July 18, 1980, debris-flow deposit 88-45 ca Castle Creek-age andesite breccia cb Castle Creek-age basaltic andesite breccia 88-47 poa Pine Creek-age dacite within shear zone Pine Creek-age Kid dome dacite 88-48 poa Dacite clast from Pine Creek-age older debris-avalanche deposit Goat Rocks-age tephra layer T; east of map area 88-51 pp Dacite clast from Pine Creek-age pyroclastic-flow deposit 88-52 pya Green dacite clast from Pine Creek-age younger debris-avalanche deposit ca Castle Creek-age andesite lava 88-53 poa Green dacite clast from Pine Creek-age older debris-avalanche deposit ca Castle Creek-age andesite lava 88-54 poa Green dacite clast from Pine Creek-age older debris-avalanche deposit 88-55 poa Dacite clast from Pine Creek-age older debris-avalanche deposit pp Dacite clast from Pine Creek-age pyroclastic flow Castle Creek-age platy andesite lava 88-56 pbd Pine Creek-age dacite of Breach dome

GEOLOGIC MAP OF THE SASQUATCH STEPS AREA, NORTH FLANK OF MOUNT ST. HELENS, WASHINGTON

88-57 pbd Pine Creek-age dacite of Breach dome

cb Castle Creek-age platy basalt

ca Castle Creek-age platy andesite

ca Castle Creek-age andesite breccia

F87-42 sad Smith Creek(?)-age dacite of Archybacter dome

F87-44 cb Castle Creek-age olivine basaltic andesite lava

89-14 cab Castle Creek-age andesite breccia

89-26 cab Castle Creek-age andesite breccia

F88-6 cb Castle Creek-age basaltic andesite lava

88-60 ka Kalama-age andesite breccia

88-58 sb Sugar Bowl-age rhyodacite of Sugar Bowl dome

cb Castle Creek-age basaltic andesite breccia

89-23 cab Castle Creek-age andesite breccia, overlies(?) unit pya

cba Castle Creek-age basaltic andesite autobreccia lava

Castle Creek-age basaltic andesite

Pine Creek-age dacite of Northeast dome

cb Castle Creek-age plagioclase-phyric basaltic andesite

sb Sugar Bowl-age rhyodacite of Sugar Bowl dome; east of map area

poa Dacite clast from Pine Creek-age older debris-avalanche deposit

Castle Creek-age basalt dike

ca Castle Creek-age platy andesite

88-35 cad Castle Creek-age andesite dike

88-37 **pkd** Pine Creek-age dacite of Kid dome

88-36 cbd Castle Creek-age basalt dike

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—2000

gp/cab Sugar Bowl-age dacite lahar

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