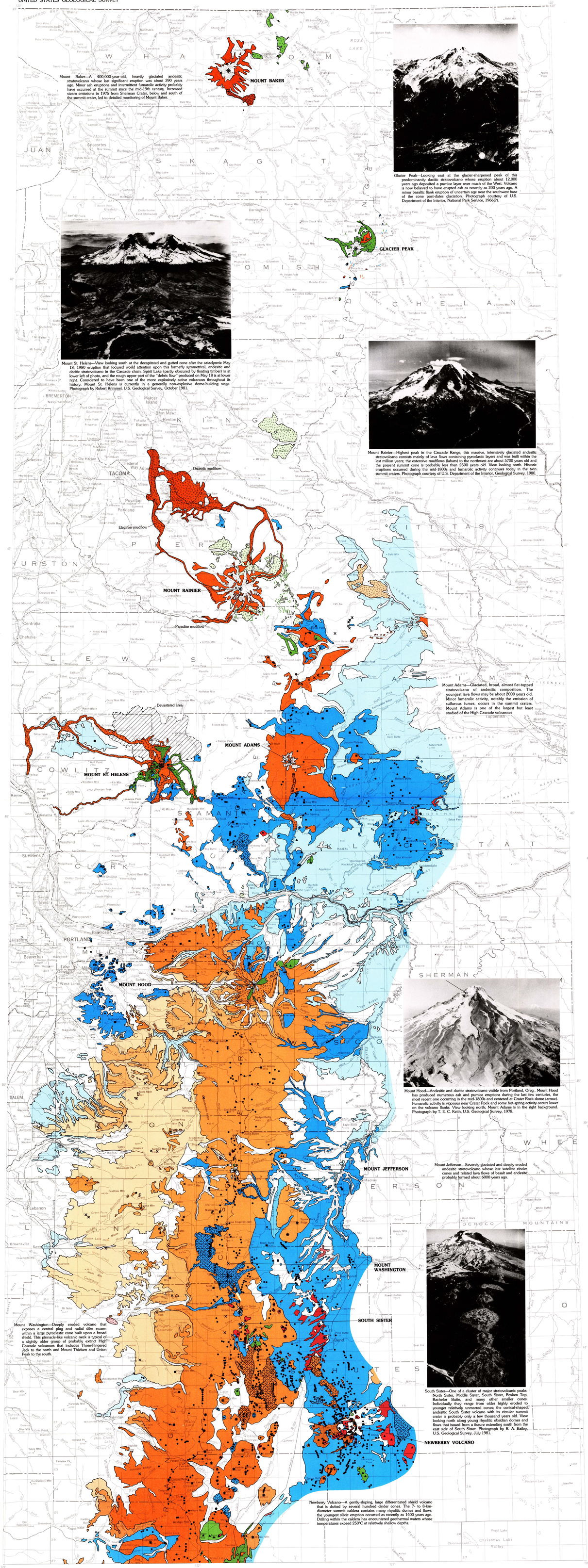


Mount Baker—A 400,000-year-old, heavily glaciated andesitic stratovolcano whose last significant eruption was about 390 years ago. Minor ash eruptions and intermittent fumarolic activity probably have occurred at the summit since the mid-19th century. Increased steam emissions in 1975 from Sherman Crater, below and south of the summit crater, led to detailed monitoring of Mount Baker.

Glacier Peak—Looking east at the glacier-sharpened peak of this predominantly dacitic stratovolcano whose eruption about 12,000 years ago deposited a pumice layer over much of the West. Volcano is now believed to have erupted ash as recently as 200 years ago. A minor basaltic flank eruption of uncertain age near the southwest base of the cone post-dates glaciation. Photograph courtesy of U.S. Department of the Interior, National Park Service, 1966(?).

Mount St. Helens—View looking south at the decapitated and gutted cone after the cataclysmic May 18, 1980 eruption that focused world attention upon this formerly symmetrical, andesitic and dacitic stratovolcano in the Cascade chain. Spirit Lake (partly obscured by floating timber) is at lower left of photo, and the rough upper part of the "debris flow" produced on May 18 is at lower right. Considered to have been one of the more explosively active volcanoes throughout its history, Mount St. Helens is currently in a generally non-explosive dome-building stage. Photograph by Robert Krimmel, U.S. Geological Survey, October 1981.

Mount Rainier—Highest peak in the Cascade Range, this massive, intensively glaciated andesitic stratovolcano consists mainly of lava flows containing pyroclastic layers and was built within the last million years; the extensive mudflows (lahars) to the northwest are about 5700 years old and the present summit cone is probably less than 2500 years old. View looking north. Historic eruptions occurred during the mid-1800s and fumarolic activity continues today in the twin summit craters. Photograph courtesy of U.S. Department of the Interior, Geological Survey, 1980.

Mount Adams—Glaciated, broad, almost flat-topped stratovolcano of andesitic composition. The youngest lava flows may be about 2000 years old. Minor fumarolic activity, notably the emission of sulfurous fumes, occurs in the summit craters. Mount Adams is one of the largest but least studied of the High Cascade volcanoes

Mount Hood—Andesitic and dacitic stratovolcano visible from Portland, Oreg., Mount Hood has produced numerous ash and pumice eruptions during the last few centuries, the most recent one occurring in the mid-1800s and centered at Crater Rock dome (arrow). Fumarolic activity is vigorous near Crater Rock and some hot-spring activity occurs lower on the volcano flanks. View looking north; Mount Adams is in the right background. Photograph by T. E. C. Keith, U.S. Geological Survey, 1978.

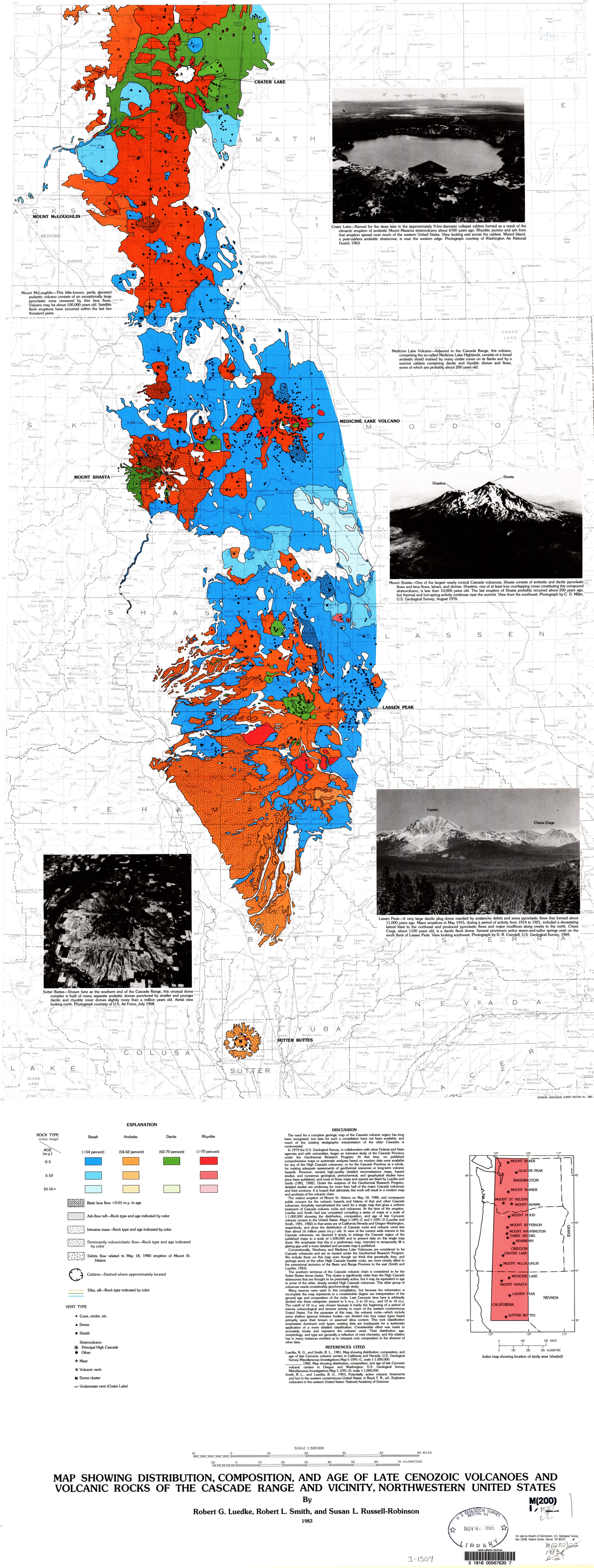
Mount Jefferson—Severely glaciated and deeply eroded andesitic stratovolcano whose late satellitic cinder cones and related lava flows of basalt and andesite probably formed about 6000 years ago.

South Sister—One of a cluster of major stratovolcanic peaks: North Sister, Middle Sister, South Sister, Broken Top, Bachelor Butte, and many other smaller cones. Individually they range from older highly eroded to younger relatively unmarred cones; the conical-shaped andesitic South Sister volcano with its circular summit crater is probably only a few thousand years old. View looking north along young rhyolitic obsidian domes and flows that issued from a fissure extending south from the east side of South Sister. Photograph by R. A. Bailey, U.S. Geological Survey, July 1981.

Mount Washington—Deeply eroded volcano that exposes a central plug and radial dike swarm within a large pyroclastic cone built upon a broad shield. This pinnacle-like volcanic neck is typical of a slightly older group of probably extinct High Cascade volcanoes that includes Three-Fingered Jack to the north and Mount Thielsen and Union Peak to the south.

Newberry Volcano—A gently-sloping, large differentiated shield volcano that is dotted by several hundred cinder cones. The 7- to 8-km-diameter summit caldera contains many rhyolitic domes and flows; the youngest silicic eruption occurred as recently as 1400 years ago. Drilling within the caldera has encountered geothermal waters whose temperatures exceed 250°C at relatively shallow depths.

Base from U.S. Geological Survey
California, 1968; Oregon, 1965; Washington, 1961



Crater Lake—Named for the deep lake in the approximately 9-km-diameter collapse caldera formed as a result of the climactic eruption of andesitic Mount Mazama stratovolcano about 6700 years ago. Rhyolitic pumice and ash from that eruption spread over much of the western United States. View looking east across the caldera. Wizard Island, a post-caldera andesitic stratocone, is near the western edge. Photograph courtesy of Washington Air National Guard, 1963.

Mount McLoughlin—This little-known, partly glaciated andesitic volcano consists of an exceptionally large pyroclastic cone veneered by thin lava flows. Volcano may be about 100,000 years old. Satellitic flank eruptions have occurred within the last few thousand years.

Medicine Lake Volcano—Adjacent to the Cascade Range, this volcano, comprising the so-called Medicine Lake Highlands, consists of a broad andesitic shield marked by many cinder cones on its flanks and by a summit caldera containing dacitic and rhyolitic domes and flows, some of which are probably about 200 years old.

Mount Shasta—One of the largest nearly conical Cascade volcanoes, Shasta consists of andesitic and dacitic pyroclastic flows and lava flows, lahars, and domes. Shastina, one of at least four overlapping cones constituting this compound stratovolcano, is less than 10,000 years old. The last eruption of Shasta probably occurred about 200 years ago, but thermal and hot-spring activity continues near the summit. View from the southwest. Photograph by C. D. Miller, U.S. Geological Survey, August 1976.

Lassen Peak—A very large dacitic plug dome mantled by avalanche debris and some pyroclastic flows that formed about 11,000 years ago. Major eruptions in May 1915, during a period of activity from 1914 to 1921, included a devastating lateral blast to the northeast and produced pyroclastic flows and major mudflows along creeks to the north. Chaos Crags, about 1100 years old, is a dacitic flank dome. Several prominent active steam-and-sulfur springs exist on the south flank of Lassen Peak. View looking southwest. Photograph by D. R. Crandell, U.S. Geological Survey, 1969.

Sutter Buttes—Shown here as the southern end of the Cascade Range, this unusual dome complex is built of many separate andesitic domes punctured by smaller and younger dacitic and rhyolitic inner domes slightly more than a million years old. Aerial view looking north. Photograph courtesy of U.S. Air Force, July 1968.

EXPLANATION

ROCK TYPE (silica range) / AGE (m.y.)	Basalt (<54 percent)	Andesite (54-62 percent)	Dacite (62-70 percent)	Rhyolite (>70 percent)
0-5				
5-10				
10-16+				

Basic lava flow <0.01 m.y. in age

Ash-flow tuff—Rock type and age indicated by color

Intrusive mass—Rock type and age indicated by color

Dominantly volcaniclastic flow—Rock type and age indicated by color

Debris flow related to May 18, 1980 eruption of Mount St. Helens

Caldera—Dashed where approximately located

Dike, sill—Rock type indicated by color

VENT TYPE

- Cone, cinder, etc.
- Dome
- Shield
- Stratovolcano
- Principal High Cascade
- Other
- Maar
- Volcanic neck
- Dome cluster
- Underwater vent (Crater Lake)

DISCUSSION

The need for a complete geologic map of the Cascade volcanic region has long been recognized, but data for such a compilation have not been available, and much of the existing stratographic interpretation of the older Cascades is controversial.

In 1979 the U.S. Geological Survey, in collaboration with other Federal and State agencies and with universities, began an intensive study of the Cascade Province under the Geothermal Research Program. At that time, no published comprehensive maps or systematic analyses based on modern data were available for any of the High Cascade volcanoes, or for the Cascade Province as a whole, for making adequate assessments of geothermal resources or long-term volcanic hazards. However, several high-quality detailed reconnaissance maps, hazard studies, and numerous geological, petrochemical, and geophysical studies have since been published, and most of these maps and reports are listed by Luedke and Smith (1981, 1982). Under the auspices of the Geothermal Research Program, detailed studies are underway for more than half of the major Cascade volcanoes and their environs. It is hoped that ultimately this work will result in a modern map and synthesis of the volcanic chain.

The violent eruption of Mount St. Helens on May 18, 1980, and consequent public concern for the volcanic hazards and history of that and other Cascade volcanoes, forcefully reemphasized the need for a single map that gives a uniform treatment of Cascade volcanic rocks and volcanoes. At the time of the eruption, Luedke and Smith had just completed compiling a series of maps at a scale of 1:1,000,000 showing the distribution, composition, and age of late Cenozoic volcanic centers in the United States. Maps I–1091–C and I–1091–D (Luedke and Smith, 1981, 1982) in that series are of California-Nevada and Oregon-Washington, respectively, and show the distribution of Cascade rocks and volcanic vents less than about 16 million years (m.y.) old. In view of the current wide interest in the Cascade volcanoes, we deemed it timely to enlarge the Cascade region of the published maps to a scale of 1:500,000 and to present data on this single map sheet. We emphasize that this is a preliminary map, intended to temporarily fill a glaring gap until a more detailed and accurate map is published.

Conventionally, Newberry and Medicine Lake Volcanoes are considered to be Cascade volcanoes and are so treated under the Geothermal Research Program. We include them on this map even though we think that genetically they, and perhaps some of the other High Cascade basaltic rocks, are more closely allied to the extensional tectonics of the Basin and Range Province to the east (Smith and Luedke, 1983).

The southern terminus of the Cascade volcanic chain is considered to be the Sutter Buttes dome cluster. This cluster is significantly older than the High Cascade stratocones that are thought to be potentially active, but it may be equivalent in age to some of the older, deeply eroded High Cascade volcanoes. This older group of volcanoes needs considerable geochronologic study.

Many sources were used in this compilation, but because the information is incomplete the map represents to a considerable degree our interpretation of the general age and composition of the rocks. Late Cenozoic time here is arbitrarily divided into three categories: present to 5 m.y., 5 to 10 m.y., and 10 to 16 m.y. The cutoff of 16 m.y. was chosen because it marks the beginning of a period of intense volcanological and tectonic activity in much of the western conterminous United States. For the purposes of this map, the volcanic rocks—which include some shallow igneous intrusive bodies—are divided into four major types based primarily upon their known or assumed silica content. This rock classification emphasizes dominant rock types; existing data are inadequate for a systematic application of a more detailed classification. Considerable effort was made to accurately locate and represent the volcanic vents. Their distribution, age, morphology, and type are generally a reflection of rock chemistry, and this relation has in many instances enabled us to interpret rock composition in the absence of other data.

REFERENCES CITED

Luedke, R. G., and Smith, R. L., 1981, Map showing distribution, composition, and age of late Cenozoic volcanic centers in California and Nevada: U.S. Geological Survey Miscellaneous Investigations Map I–1091–C, scale 1:1,000,000.

_____ 1982, Map showing distribution, composition, and age of late Cenozoic volcanic centers in Oregon and Washington: U.S. Geological Survey Miscellaneous Investigations Map I–1091–D, scale 1:1,000,000.

Smith, R. L., and Luedke, R. G., 1983, Potentially active volcanic lineaments and loci in the western conterminous United States, in Boyd, F. R., ed., Explosive volcanism in the western United States: National Academy of Sciences.

Index map showing location of study area (shaded)

SCALE 1:500 000

10 0 10 20 30 40 50 MILES

10 0 10 20 30 40 50 60 70 KILOMETERS

MAP SHOWING DISTRIBUTION, COMPOSITION, AND AGE OF LATE CENOZOIC VOLCANOES AND VOLCANIC ROCKS OF THE CASCADE RANGE AND VICINITY, NORTHWESTERN UNITED STATES

By

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1983

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