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1982

MAP MF-1394-C Strawberry Crater is located about 12 mi (20 MINERAL RESOURCE POTENTIAL km) northeast of the San Francisco Mountain

SUMMARY STATEMENT stratovolcano (fig. 1), which developed largely between approximately 1.0 and 0.4 m.y. ago. The The Strawberry Crater Roadless Areas, Coconino northeast quadrant of the volcano has been County, Arizona, have some potential for deposits of cinder (fig. 1) for the production of aggregate block and for deposits of decorative stone. However, similar deposits occur in great abundance throughout the San Francisco volcanic field outside the study area and should essentially eliminate any necessity of developing deposits within the Strawberry Crater Roadless Areas. There is a possibility that the Strawberry Crater Roadless Areas overlie part of a crustal magma chamber or still warm pluton related to the Quaternary San Francisco Mountain stratovolcano or to basaltic vents of late Pleistocene or Holocene

# INTRODUCTION

the energy source from which a hot-, dry-rock

geothermal energy system could be developed.

age. Such a magma chamber or pluton beneath the

Strawberry Crater Roadless Areas might prove to be

The Strawberry Crater Roadless Areas are located in Coconino County, Arizona, approximately 20 mi (30 km) northeast of Flagstaff, Arizona, in T. 23 and 24 N., R. 9 E. Together the two study areas encompass 9840 acres (about 40 km²) in the northeastern portion of the Coconino National Forest in the eastern San Francisco volcanic field in the southwestern Colorado Plateau physiographic province.

The Strawberry Crater Roadless Areas are accessible from U. S. Highway 89 by several interconnecting Forest Service roads. The area is bounded on the west by a high-voltage transmission line and on the southeast by the paved road connecting Sunset Crater and Wupatki National Monuments (fig. 1).

## GEOLOGY

The eastern San Francisco volcanic field was previously mapped and described in detail by Moore and Wolfe (1976). The area, in the southern part of the Colorado Plateau, is underlain by Quaternary lavas and cinder cones that overlie nearly horizontal Permian Kaibab Limestone or Triassic siltstone or sandstone of the Moenkopi Formation. Holocene basaltic cinders from the eruption of Sunset Crater mantle much of the area. Locally, basaltic ash has been reworked to form small dunes.

Basalt lavas and the related cinders and spatter are alkali-olivine basalts with variable abundances of olivine, clinopyroxene, and plagioclase phenocrysts. Within and adjacent to the Strawberry Crater Roadless Areas, they have been assigned, largely on stratigraphic and physiographic grounds, to four age groups (Moore and Wolfe, 1976), from oldest to youngest: the Woodhouse, Tappan, Merriam, and Sunset age groups. K-Ar dating (Damon and others, 1974; Damon and Shafiqullah, unpublished data) suggests that Woodhouse age lavas in the Strawberry Crater quadrangle range from 0.5 to 1.5 m.y. old, Tappan age lavas range from about 0.2 to 0.6 m.y. old, and Merriam age lavas range from a few thousand or tens of thousands of years to about 0.15 m.y. old. Tree-ring dating (Smiley, 1958), indicates that the lavas and cinders of the Sunset Crater eruptions are less than 1000 years old.

The Strawberry Crater flow consists of blocky basaltic andesite dated at less than 100,000 years old (Damon and others, 1974). The basaltic andesite contains abundant phenocrysts of corroded plagioclase and a few small phenocrysts of olivine, clinopyroxene, and orthopyroxene in a very fine to glassy groundmass. The cone, built largely of agglutinated basaltic andesite spatter, was breached by the flow. Subsequently a small dacite vitrophyre plug with phenocrysts of plagioclase and orthopyroxene was emplaced within the breached cone. In addition to resting on older Quaternary basalt, Strawberry Crater and its lava flow overlie the east edge of the rhyodacite of Deadman Mesa, which erupted from the O'Leary Peak silicic center and has been dated at about 0.17 m.y. old (Damon and Shafiqullah, unpublished data).

transected by a northeast-trending linear depression, the Interior Valley. At the southwest end of the depression is the core ridge, which has a strong linear topographic element parallel to the Interior Valley and is an exposed portion of the conduit system that fed the stratovolcano. Directly in the mouth of the Interior Valley is the Sugarloaf rhyolite dome, and approximately on the same northeast trend are the O'Leary Peak silicic center (largely rhyodacite) and Strawberry Crater. Sugarloaf is approximately 0.22 m.y. old, and two O'Leary Peak eruptive units are dated at approximately 0.17 and 0.24 m.y. old (Damon and others, 1974; Damon and Shafiqullah, unpublished data). The Interior Valley formed after construction of the stratovolcano and before the eruption of the Sugarloaf rhyolite dome--between approximately 0.4 and 0.22 m.y. ago. Coincidence of the line of youthful vents with the linear trend of the similarly youthful Interior Valley suggests that the core ridge, Sugarloaf, the O'Leary Peak silicic center, and the Interior Valley all formed under the influence of a common volcano-tectonic control, and the relatively narrow age span suggests further that

MISCELLANEOUS FIELD STUDIES

#### GEOPHYSICS

the magmas may be closely related in genesis.

The group of alined vents described above coincides closely with a sharply defined aeromagnetic low that is strongly linear and a mile or so (about 2 km) wide (Wolfe and Hoover, 1982). The magnetic lineament continues into the Strawberry Crater Roadless Area, where it presumably marks the northeast extension of the volcano-tectonic feature recorded by the Interior Valley.

#### GEOCHEMISTRY

Semi-quantitative spectrographic analyses of 18 samples of flow and pyroclastic units are given in Wolfe and Hahn (1982). The range of values is appropriate for unaltered basaltic rocks and shows no indication that mineral deposits are present.

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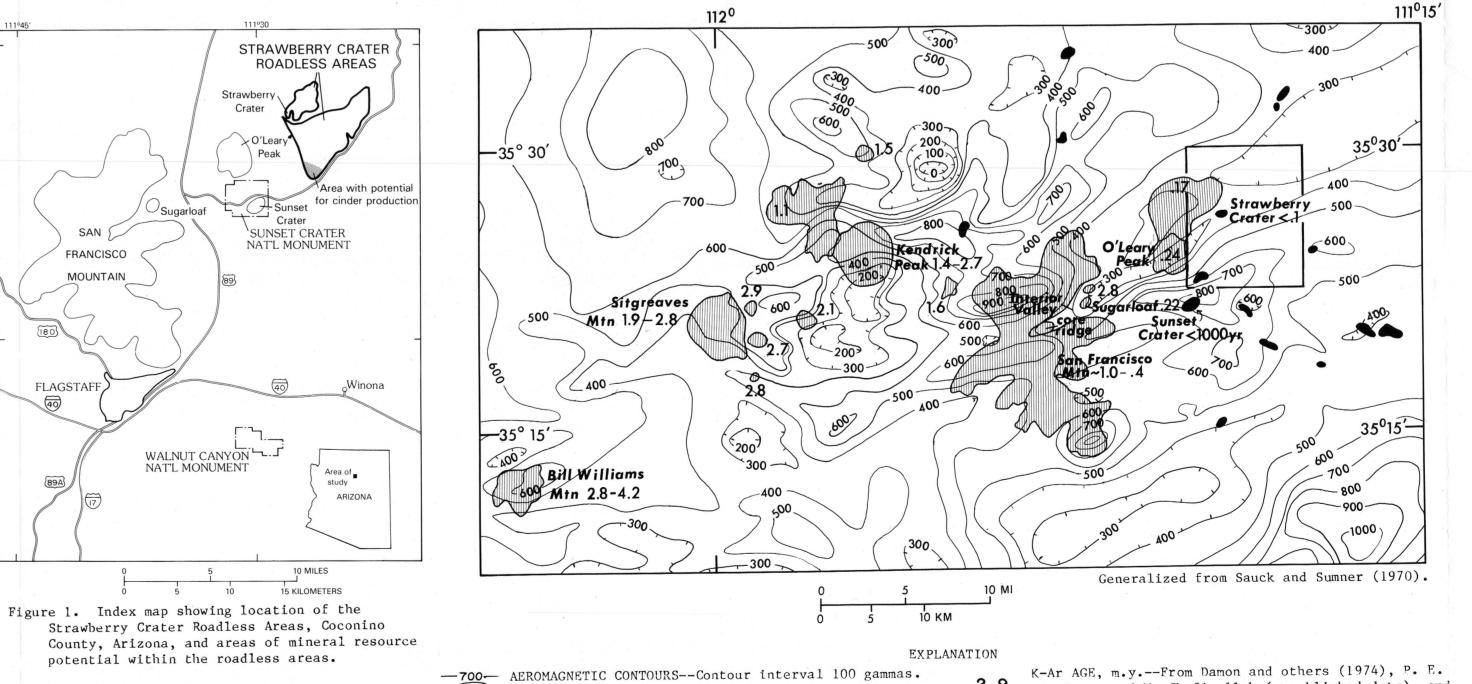
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-700- AEROMAGNETIC CONTOURS--Contour interval 100 gammas. Hachures indicate closed aeromagnetic low

VOLCANIC ROCKS OF ANDESITIC TO RHYOLITIC COMPOSITION BASALT OR BASALTIC ANDESITE VENT OF MERRIAM OR SUNSET AGE (<150,000 YRS.)

Damon and M. Shafiqullah (unpublished data), and E. H. McKee (unpublished data) <IOOO yr AGE OF SUNSET CRATER--Tree-ring age from Smiley (1958)</pre>

OUTLINE OF ACCOMPANYING MAP AREA

Figure 2. Residual aeromagnetic map of the San

EXPLANATION Patented mining claims Unpatented mining claims, regardless of status \_\_\_\_ Approximate boundary

Figure 3. Patented and unpatented mining claims in the vicinity of the Strawberry Crater Roadless

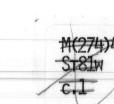
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CORRELATION OF MAP UNITS

AGE GROUP 1/

Basaltic rocks of Sunset age

Basaltic rocks of Merriam age

Basaltic rocks of Woodhouse age

Basaltic rocks of Tappan age

DESCRIPTION OF MAP UNITS

EOLIAN AND ALLUVIAL DEPOSITS

EOLIAN DEPOSITS (HOLOCENE) -- Basalt ash

ALLUVIUM AND COLLUVIUM (HOLOCENE AND

BASALTIC ROCKS

BASALTIC ROCKS OF SUNSET AGE (HOLOCENE)

Basaltic pyroclastic sheet from eruption

Kana-a flow from Sunset Crater--Alkali

BASALTIC ROCKS OF MERRIAM AGE (PLEISTOCENE)

Basaltic andesite cinder and spatter

Vitrophyre plug of Strawberry Crater

REA WITH POTENTIAL FOR CINDER PRODUCTION

FAULT--Dotted where concealed; U, upthrown; D, downthrown side

- APPROXIMATE BOUNDARY OF STRAWBERRY CRATER ROADLESS AREAS

----- CONTACT--Also distinguishes adjacent flows or adjacent cones within the same age group

BASALTIC PYROCLASTIC SHEET--Thin discontinuous mantle from eruption of Sunset Crater overlying

PLEISTOCENE)

of Sunset Crater

Basaltic cinder cone

Basaltic andesite flow

●3 SAMPLE NUMBER AND LOCATION

another mapped unit

Basalt flow

Basaltic pyroclastic sheets

olivine basalt

TRPs

O'LEARY PEAK

VOLCANIC CENTER

Qor

Qoo

EOLIAN AND ALLUVIAL

Holocene

Pleisto-

cene

BASALTIC ROCKS OF TAPPAN AGE (PLEISTOCENE)

O'LEARY PEAK VOLCANIC CENTER (PLEISTOCENE)

SEDIMENTARY ROCKS OF TRIASSIC AND PERMIAN

conglomerate of the Triassic Moenkopi

minor sandstone and siltstone of the

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577,

of a mineral-resource potential survey of the

Strawberry Crater Roadless Areas in the Coconino

National Forest, Coconino County, Arizona. The

September 3, 1964) and related Acts require the U.

S. Geological Survey and the U. S. Bureau of Mines

to survey certain areas to determine their mineral

resource potential. Results must be made available

to the public and be submitted to the Administration

and the Congress. This report presents the results

Strawberry Crater Roadless Areas were classified as

further planning areas during the Second Roadless

Area Review and Evaluation (RARE II) by the U. S.

Forest Service, January 1979.

AGE--Red sandstone with minor shale and

Formation. Sandy dolomitic limestone and

Rhyodacite obsidian flow north of O'Leary

Local basalt pyroclastic deposits

Basaltic andesite porphyry dome

Rhyodacite flow of Deadman Mesa

BASALTIC ROCKS OF WOODHOUSE AGE

Permian Kaibab Limestone

(PLEISTOCENE)

Basalt flows

Basalt cinder cones

Quaternary

Triassic

and Permian