U.S. DEPARTMENT OF THE INTERIOR

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Geologic map of parts of the Tippett Canyon and Spring Creek Flat NW, Nevada, and Georgetta Ranch, Nevada-Utah, quadrangles, emphasizing Tertiary rocks and including chemical analyses—scale 1:50,000

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INTRODUCTION

The Goshute Reservation encompasses parts of the Deep Creek Range and the adjacent basin to the west in eastern Nevada and western Utah (fig. 1). The Deep Creek Range is underlain by Proterozoic metasedimentary rocks, Paleozoic clastic and carbonate rocks, and Tertiary sedimentary and volcanic rocks. This geologic map shows the distribution of Eocene to Oligocene volcanic rocks and Miocene to Pliocene sedimentary rocks that are within or near the boundaries of the Goshute Indian Reservation (fig. 1). Mapping, both in the field and by interpretation of aerial photography, was completed during a mineral resource assessment of the Reservation by the U.S. Geological Survey, contracted by the Goshute Indian Tribe and funded by the Bureau of Indian Affairs.

PREVIOUS WORK

Tertiary volcanic rocks in the western part of the Deep Creek Range are shown on maps by Nelson (1966) and Rodgers (1987). The distribution of younger Tertiary sedimentary rocks, as determined from aerial photographs, is shown on the White Pine County map (Hose and Blake, 1976).

EOCENE TO OLIGOCENE VOLCANIC ROCKS

Eocene to Oligocene volcanic rocks in and near the Goshute Reservation are calc-alkaline andesite, dacite, rhyolite, trachydacite, and trachyandesite with silica contents ranging from 60 to 71 weight percent SiO_2 (figs. 2 and 3, table 1). The volcanic sequence, from oldest to youngest, consists of a basal non-welded ash-flow tuff; near-source intermediate-composition flows, flow breccias, and minor tuffs; and dacite domes. These rocks are part of an extensive volcanic field, now exposed as scattered remnants, in northeastern Nevada and adjacent Utah (Christiansen and Yeats, 1992; Thorman and others, 1993). Eocene to Oligocene volcanic rocks are restricted to the western part of the southern Deep Creek Range and to the basin; where the contact is exposed, volcanic rocks lie unconformably on Permian and Pennsylvanian clastic and carbonate rocks. Rodgers (1987) estimated that the volcanic section in the southern Deep Creek Range is 500 to 700 feet thick.

The basal non-welded ash-flow tuff, which crops out sporadically in the southern Deep Creek Range, is characterized by millimeter-sized quartz, biotite, and plagioclase phenocrysts and conspicuous centimeter-sized muscovite; it represents the onset of Eocene volcanism. In the southern Deep Creek Range, isolated outcrops of the tuff (this map; Rodgers, 1987) suggest that its distribution is dependent on syn-volcanic paleotopography and post-eruption erosion. The source of the tuff is unknown. Separates of millimeter-sized biotite from the groundmass and centimeter-sized muscovite xenocryst yielded $^{40}Ar/^{39}Ar$ dates of 40.6 Ma and 40.1 Ma, respectively (L.W. Snee, written commun., 1993). These ages are slightly older than the $^{40}Ar/^{39}Ar$ dates of 39.5 Ma (biotite) and 39.6 Ma (muscovite) determined on similar rock by Gans and others (1989). The muscovite is interpreted as xenocrystic based on (1) the lack of co-existing sanidine in the tuff, (2) the contrast in size between the muscovite (centimeters) and biotite, quartz, and plagioclase phenocrysts (millimeters), (3) an erratic distribution of muscovite, and (4) a mostly metaluminous composition (fig. 4).

In the map area, the sequence of intermediate-composition flows and rare tuffs that overlie the basal ash-fall tuff are associated with a north-trending series of small vents, which, in places, display shield-like morphologies. Scoria and cinder blocks, pyroclastic deposits, vesicular blocks to 1 meter in diameter, and black vitrophyre are associated with the vents. At Sanford Spring, spectacular flow breccia with meters-sized blocks indicate a nearby source. At the Narrows, in the northern part of the map area, flow foliation is convoluted and steeply dipping, and indicates a local source. Gans and others (1989) obtained dates of 37.7 and 36.0 from the intermediate-composition rocks; a biotite age

from the map unit called Dacite of the Narrows is 35.4 Ma (W.E. Brooks and L.W. Snee, U.S. Geological Survey, unpub. data, 1994).

NEOGENE TO QUATERNARY ROCKS

Miocene and younger layered rocks consist of reworked tuff, tuffaceous siltstone and shale, conglomerate, and sandstone. These poorly consolidated rocks fill, and are exposed in, the basin. The rocks are younger than, but continuous with, sedimentary rocks that crop out to the north near Gold Hill and the Goshute Range. Perkins and others (1993) indicate that sediments in the area collected in a basin that first developed in the Miocene. Environments of deposition are interpreted as fluvial and lacustrine (R.F. Dubiel, U.S. Geological Survey, oral commun., 1994).

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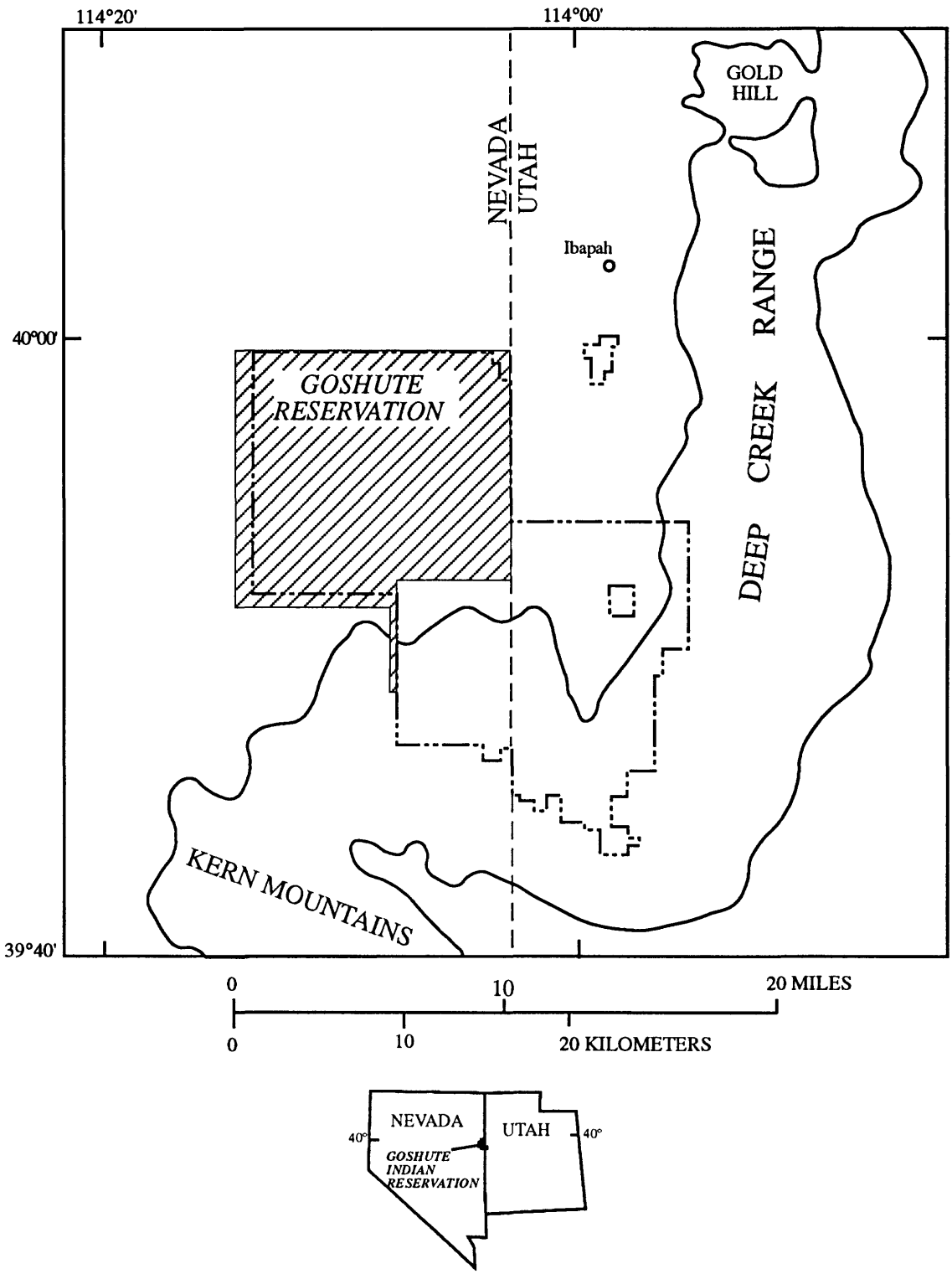

Figure 1. Locality map of the Deep Creek Range and the Goshute Reservation (dot-dash lines), Nevada and Utah. Map area shaded.

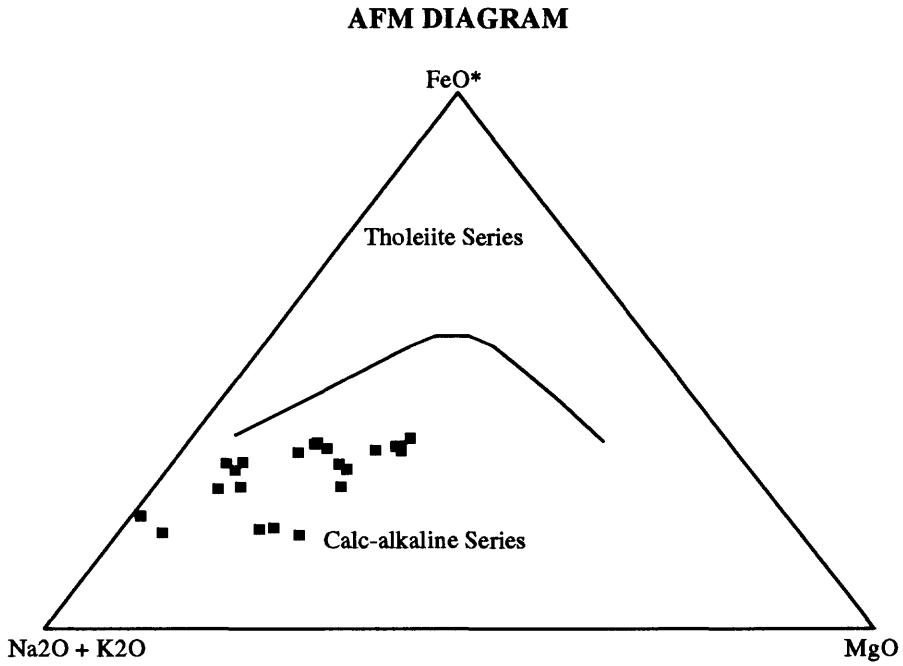

Figure 2. AFM [(Na_2O + K_2O); total iron as FeO; and MgO] diagram using major oxide analyses of volcanic rocks from the Goshute Indian Reservation. Calc-alkaline trend from Irvine and Baragar (1971).

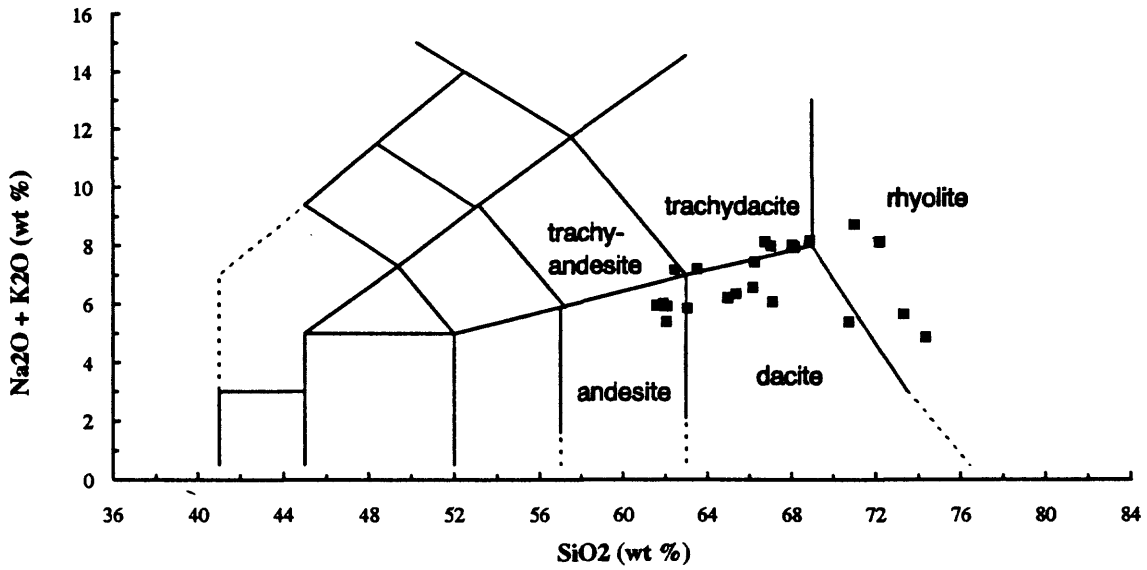

Figure 3. TAS (Na_2O + K_2O versus SiO_2) classification diagram using major oxide analyses of volcanic rocks from the Goshute Indian Reservation. Grid from Le Bas and Streckeisen (1991).

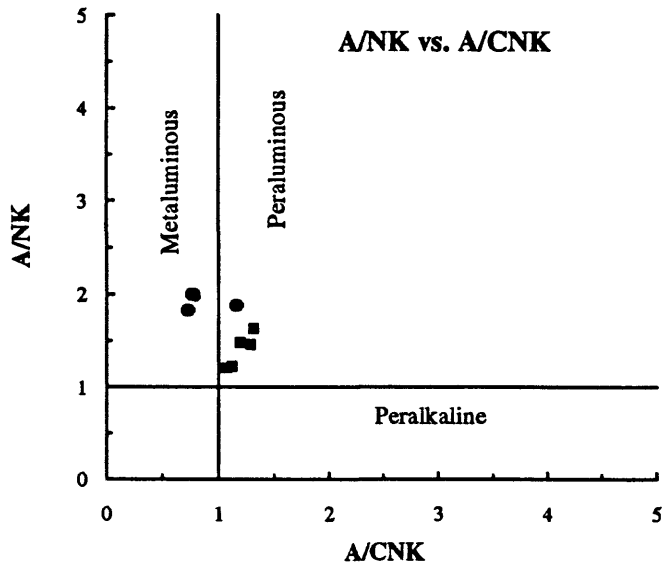

Figure 4. A/NK (molecular proportion of Al_2O_3 divided by the sum of the molecular proportions of Na_2O + K_2O) versus A/CNK (molecular proportion of Al_2O_3 divided by the sum of the molecular proportions of CaO + Na_2O + K_2O) diagram used to define metaluminous, peraluminous, and peralkaline rocks (Carmichael and others, 1974). ● , analyses of muscovite-bearing tuff from the Sanford Spring area just west of the Reservation boundary; ■ , analyses of Macusani tuff from Peru, in which muscovite is a primary phase (Noble and others, 1984).

Table 1. Analyses of volcanic rocks from the Goshute Indian Reservation, White Pine County, Nevada, and Juab County, Utah

[Major oxides (weight percent, uncorrected) determined by X-ray spectroscopy; analysts J.S. Mee and D.F. Siems. LOI, loss on ignition at 925°C. *, indicates dated sample. Rb, Sr, Y, Zr, Nb, and Ba analyses (parts per million) determined on an energy dispersive analyzer, ^{109}Cd source and ^{241}Am source (Ba only) by K. Woodburne. Error is 10% of ppm listed or ±6 (Rb), ±5 (Sr), ±4 (Y), ±3 (Zr), ±3 (Nb), and ±10 (Ba), whichever is greater]

Map Unit——	Tr	Tdn	Tdn	Tdn	Tdn	Tif	Tif	Tif	Tif	Tif	Tif
Lab No.———	D-516482	D-516484	D-516485	D-516486	D-516487	D-516488	D-516489	D-516490	D-516491	D-516495	D-516497
Field No.——	92B70	92B16	92B19	92B24*	92B26	92B13	92B14	92B15	92B21	92B28	92B33
Latitude———	39°51'40"	39°57'13"	39°57'43"	39°59'59"	39°59'23"	39°55'27"	39°54'24"	39°54'16"	39°58'13"	39°48'24"	39°48'09"
Longitude——	114°09'53"	114°07'07"	114°06'42"	114°07'53"	114°04'50"	114°10'47"	114°11'06"	114°11'02"	114°07'56"	114°08'14"	114°07'50"
SiO_2	70.8	67.0	64.0	65.4	69.0	66.0	60.6	66.4	61.3	60.9	62.8
Al_2O_3	13.9	14.8	15.1	14.8	13.8	15.9	16.1	14.8	14.6	15.7	15.9
$FeTO_3$	2.07	3.53	4.43	3.63	2.55	4.28	5.41	4.28	5.33	5.55	4.11
MgO	0.53	0.94	2.03	1.26	0.11	1.05	2.18	0.80	2.13	3.78	2.66
CaO	2.34	2.63	3.64	2.94	3.07	3.13	5.25	2.95	5.59	5.74	4.63
Na_2O	3.07	3.05	2.77	2.99	3.28	3.34	2.97	2.93	2.85	3.28	3.16
K_2O	4.90	4.91	3.03	4.73	5.22	4.71	3.99	4.82	4.11	2.54	2.86
TiO_2	0.37	0.45	0.55	0.45	0.20	0.50	0.60	0.52	0.64	0.77	0.61
P_2O_5	0.25	0.18	0.15	0.18	0.10	0.21	0.28	0.19	0.29	0.20	0.19
MnO	0.05	0.06	0.06	0.07	0.08	0.09	0.12	0.08	0.1	0.09	0.07
LOI	0.79	1.51	3.55	2.56	1.48	<0.01	1.69	1.26	1.81	0.80	2.38
total	99.07	99.06	99.31	99.01	98.89	99.22	99.19	99.03	98.75	99.35	99.37
Rb	194	206	194	206	241	189	168	198	167	77	91
Sr	224	281	255	276	157	331	383	269	350	474	513
Y		24	23	26	25	22	32	21	27	21	2015
Zr	213	210	197	218	192	234	202	205	201	186	182
Nb	21	21	18	20	22	18	11	21	16	13	16
Ba	423	1239	1208	1141	981	1163	1234	1245	1576	1126	1288

Table 1. Analyses of volcanic rocks from the Goshute Indian Reservation, White Pine County, Nevada, and Juab County, Utah—Continued

Map Unit-----	Tif	Tif	Tif	Tif	Tif	Tif	Tif	Tif	Tt	Tt	Tt
Lab No.------	D-516496	D-516492	D-516493	D-516494	D-516483	D-503370	D-503371	D-503372	D-516498	D-516499	D-516500
Field No.-----	92B34	92B60	92B62	92B69	92B71	91T30	91T32	91T33	92B27*	92B38	92B67
Latitude------	39°48'16"	39°59'20"	39°52'30"	39°51'39"	39°51'10"	39°48'26"	39°48'23"	39°48'35"	39°48'39"	39°49'29"	39°48'15"
Longitude----	114°07'44"	114°08'04"	114°10'37"	114°09'49"	114°08'01"	114°08'15"	114°08'15"	114°08'25"	114°07'55"	114°07'31"	114°11'32"
SiO_2	60.7	64.5	65.0	65.0	62.5	60.8	59.8	60.0	69.2	67.4	65.6
Al_2O_3	16.1	14.3	14.6	14.9	15.5	15.9	16.0	16.0	13.7	11.1	12.6
$FeTO_3$	4.86	5.05	4.45	4.51	4.28	5.56	5.31	5.44	1.79	1.42	1.62
MgO	3.01	1.93	1.06	2.65	2.69	3.71	3.80	3.61	1.54	1.12	1.81
CaO	5.37	3.88	3.72	4.14	4.92	5.73	5.76	5.84	2.57	5.00	5.88
Na_2O	2.81	2.80	2.93	3.02	2.95	3.38	3.03	2.76	2.51	1.35	2.58
K_2O	2.83	4.46	4.82	3.43	3.14	2.55	2.75	2.47	2.84	3.06	2.44
TiO_2	0.72	0.55	0.51	0.73	0.64	0.78	0.76	0.75	0.24	0.20	0.22
P_2O_5	0.20	0.23	0.18	0.19	0.20	0.20	0.21	0.19	0.12	0.11	0.12
MnO	0.08	0.09	0.09	0.07	0.07	0.08	0.08	0.09	0.04	0.02	0.03
LOI	2.96	1.36	1.49	0.55	2.23	0.81	1.41	2.22	4.46	8.48	6.23
total	99.64	99.15	98.85	99.19	99.12	99.5	98.91	99.37	99.01	99.26	99.13
Rb	76	195	191	136	92	83	94	75	78	60	85
Sr	475	226	284	383	481	490	513	463	373	637	412
Y		24	26	31	23	17	30	21	24	14	1317
Zr	165	198	210	225	198	194	190	174	114	93	111
Nb	10	24	16	15	14	15	13	5	8	12	9
Ba	827	1138	1277	1162	1271	1143	1195	979	1343	1761	1373