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Paleozoic and Lower Mesozoic Volcanism and Continental Growth in the Western United States

by

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NOTE: All citations to published literature are listed under References Cited in the original article.

Locations and Petrographic Descriptions of all Samples

Valmy (Low K_2O)

JR-71-50 and 51 were collected from the westernmost thrust slice of Valmy rocks along the north side of Water Canyon in the northwestern Sonoma Range, Nevada (Gilluly, 1967). JR-71-153 and 161 are from the western side of the Shoshone Range, Nevada, in an outcrop 1.5 miles west of Shwin Ranch just south of the dirt road that joins Shwin Ranch with roads in the intermontane valley to the west (Gilluly and Gates, 1965).

JR-71-50 and 51 are porphyritic and contain sericitically altered plagioclase phenocrysts in a fine-grained, or partially formerly glassy, groundmass showing abundant clayey and calcitic alteration. JR-71-153 and 161 are aphyric with the exception of a few plagioclase phenocrysts and some possible spherulitic devitrification textures; both samples show abundant clayey alteration of the groundmass and minor vein calcite.

Valmy (High K_2O)

JR-71-49, 52, 55, and 56 were collected from Water Canyon in the Sonoma Range, Nevada, from the same area as samples 50 and 51.

JR-71-49, 52, 55, and 56 are nearly aphyric, with a few pyroxene and altered plagioclase phenocrysts. The groundmass consists of altered feldspar, pyroxene, chlorite, clays, calcite, epidote, and minor quartz.

Schoonover

JR-71-181, 182, 183, 184, and 185 were taken along Jack Creek in the Independence Range, northeastern Nevada. Samples were collected from the Dorsey Creek member at the locations mapped as volcanic by Fagan (1962) in the vicinity of Lat. 41°32′N, Long. 116°02′W and Lat. 41°34′N, Long. 116°00′W.

JR-71-181 and 185 are slightly porphyritic with a few chloritized mafic phenocrysts and sparse plagioclase phenocrysts. Groundmass of clayey-altered plagioclase, chlorite, and opaque and semi-opaque minerals. Calcite is present in veinlets in sample 181 and in minor amounts in the groundmass of sample 185.

JR-71-182, 183, and 184 are essentially aphyric with a clayey-altered groundmass of plagioclase, chlorite, and opaque and semi-opaque minerals. Samples 182 and 183 contain fine quartz veinlets, and sample 184 contains minor calcite patches. Sample 184 appears slightly brecciated.

Pumpernickel

JR-71-84 to 92 were taken from the westernmost outcrop of Pumpernickel Formation along the northern side of Grand Trunk Canyon in the Sonoma Range, Nevada (Ferguson and others, 1951). Sample 84 is near the base of the truncated section, and sample 92 is near the top of the section at the crest of the ridge north of the canyon.

JR-71-84 and 85 are slightly diabasic, with sericitized plagioclase and altered ferromagnesian minerals recognizable in a matrix of altered plagioclase, chlorite, amphibole, opaque minerals, and minor epidote. Minor secondary quartz in Sample 84.

JR-71-86 to 92 are essentially aphyric and consist of sericitized plagioclase, opaque minerals, light green amphibole, chlorite, and minor epidote. Samples 87 and 92 contain scattered, presumably secondary, quartz.

Farrell Canyon (Low MgO)

JR-71-100 and 102 are from the Osgood Mountains, Nevada, along a dirt road labeled "Burma Road". Samples were collected along a creek in section 25, T39N, R41E, with sample 100 south of the creek and sample 102 north of the creek. (Hotz and Willden, 1964).

JR-71-100 and 102 are porphyritic, with long, slender, phenocrysts of sericitized plagioclase in a groundmass of plagioclase and altered glass or aphanitic material. Sample 100 contains patches of calcite, and sample 102 contains minor calcite veinlets.

Farrell Canyon (High MgO)

JR-71-103 and 105 are from the same locality as samples 100 and 102 (Low MgO). Sample 103 is south of the creek and 105 north of the creek.

JR-71-103 and 105 have phenocrysts of sericitized plagioclase, some of which show apparent sub-ophitic intergrowth with altered pyroxene. Groundmass of clayey- and chloritically-altered plagioclase, ferromagnesian minerals, and opaque minerals. Minor calcite in sample 105.

Happy Creek

JR-71-58 to 64 were collected along the eastern side of the Jackson Mountains, northwestern Nevada. Sample 58 is low in the Happy Creek section at this outcrop, and sample 64 is near the upper contact with the overlying Triassic sequence. Samples were taken along a creek in the vicinity of Lat. 41°17′N, Long. 118°22′W. (Willden, 1964).

JR-71-58 to 64 are petrographically similar, with porphyritic or seriate porphyritic texture consisting of sericitized plagioclase laths in a groundmass of plagioclase, opaque minerals, and alteration products. Alteration consists of development of sericite, chlorite, calcite, semi-opaque material, and some amphibole replacing clinopyroxene. Sample 61 has minor amygdules of calcite and zeolite. All analyzed samples are flow rocks.

Jackson Mountains Triassic

JR-71-65 to 75 were collected from the same location as the Happy Creek samples in an outcrop of TrPu along the north side of the creek. Sample 65 is low in the section, toward the underlying Happy Creek Formation, and sample 75 is toward the top. (Willden, 1964).

JR-71-65 and 66 contain large phenocrysts of clinopyroxene and sericitized plagioclase in a groundmass of plagioclase, pyroxene, minor opaque minerals, and altered glass. Alteration products are mainly amphibole, chlorite, and epidote. Some veining by epidote, calcite, quartz, and prehnite (?).

JR-71-67 and 68 contain large clinopyroxene phenocrysts in a groundmass of altered feldspar and mafic minerals. Some quartz veining.

JR-71-69 is aphyric and consists of altered plagioclase, pyroxene, glass, and opaque minerals. Moderate veining and alteration by epidote and quartz.

JR-70 and 71 are lithic breccias or brecciated flows consisting of large clinopyroxene and sericitized plagioclase grains in a matrix of plagioclase, pyroxene, chlorite, amphibole, epidote, and semi-opaque material. Considerable blurring of fragmental texture by alteration and recrystallization.

JR-71-72 to 75 are porphyritic to glomeroporphyritic with large clinopyroxene and sericitized plagioclase phenocrysts in an altered groundmass consisting mainly of plagioclase, pyroxene, opaque minerals, amphibole, and epidote. Sample 73 contains minor brown hornblende, possibly replacing pyroxene. Slight epidote and quartz veining.

Excelsior

All data for the andesite and chert-volcanic units are from Talukdar (1972).

Soda Mountains, Warm Springs, Inyo Mountains, and Alabama Hills

All data for the Soda Mountain Formation and the andesite and tuff of the Warm Springs Formation reported in Table 2 and Figure 5 A to C are from Abbott (1972). All data for the Inyo Mountains and Alabama Hills areas illustrated in Figure 5D are also from Abbott (1972). SiO_2 values reported by Abbott have been recalculated for this paper.

Gillis

All data for the Gillis Formation are from Talukdar (1972).

Bodie Hills Triassic

JR-72-24 to 27 were collected from the southeastern edge of an outcrop of Tre in sections 3 and 4, T2N, R26E in the Bodie Hills, California (Chesterman, 1968). The samples are from small volcanic ridges in the sedimentary section.

JR-72-24. Inequigranular, unoriented intergrowth of fibrous plagioclase (possibly partly relict lath texture) and light green amphibole; minor opaque minerals and quartz.

JR-72-25. Similar to sample 24 but slightly coarser grained. Some relict fragmental texture possibly shown by abrupt grain size variations.

JR-72-26 and 27. Highly inequigranular (possibly relict fragmental) intergrowth of plagioclase and light green amphibole with minor opaque minerals and epidote; some chlorite altering ferromagnesian minerals.

Yerington Triassic

JR-71-1 to 27 were collected from a series of westward-dipping volcanic rocks (Traf symbol on map of Knopf, 1918) along a dirt road extending into the eastern part of the mountains just south of Mason, Nevada. Sample 27 is near the outer, eastern, contact and consequently lowest in the section. Sample 1 is about 1500 feet stratigraphically higher in the section, and samples are numbered sequentially, with higher numbers indicating lower position in the section.

Petrographically the rocks are highly variable. Most samples appear to be flow rocks, but a few samples show poorly preserved, brecciated or volcaniclastic textures.

JR-71-1. Plagioclase phenocrysts in a groundmass of plagioclase, light green amphibole, epidote, opaque minerals, and minor quartz.

JR-71-2 Plagioclase phenocrysts (sericitized) in a groundmass of plagioclase, quartz, epidote, opaque minerals, and minor chlorite and amphibole.

JR-71-3. Aphyric, very fine grained. Consists of quartz, feldspar, chlorite, epidote, opaque minerals.

JR-71-4. Sericitized plagioclase phenocrysts and minor amphibole or amphibolitized pyroxene phenocrysts in a groundmass of plagioclase, chlorite, biotite, epidote, and opaque minerals.

JR-71-5. Sericitized plagioclase and amphibolitized mafic phenocrysts in a groundmass of plagioclase, amphibole, opaque minerals, and epidote.

Yerington (continued)

JR-71-6. Phenocrysts of quartz, sericitized plagioclase, and possibly biotite (now chloritized) in a groundmass of quartz, feldspar, chlorite, and clays.

JR-71-7. Phenocrysts of sericitized plagioclase in a groundmass of plagioclase, biotite, amphibole, opaque minerals, epidote, and chlorite.

JR-71-8. Sericitized plagioclase phenocrysts in a groundmass of quartz, feldspar, sericite, chlorite, biotite, and opaque minerals.

JR-71-9. Inequigranular texture. Consists of feldspar, quartz, biotite, sericite, chlorite, amphibole, and opaque minerals.

JR-71-10. Aphyric. Some relict flow structure in a mosaic of plagioclase laths. Consists primarily of plagioclase, light green amphibole, chlorite, opaque minerals, and sericite; some epidote.

JR-71-11 Sericitized plagioclase phenocrysts in a groundmass of plagioclase, biotite, opaque minerals, sericite, and minor quartz, epidote, and chlorite.

JR-71-12. Sericitized plagioclase phenocrysts and mafic phenocrysts altered to green amphibole and opaque minerals. Groundmass consists of plagioclase, quartz, chlorite, amphibole, biotite, sericite, chlorite, opaque minerals, and epidote.

JR-71-13. Similar to sample 12.

JR-71-14. Phenocrysts of slightly sericitized plagioclase , light green hornblende, and quartz in a groundmass of plagioclase, amphibole, quartz, sericite, chlorite, and minor epidote. A few large, euhedral sphene crystals.

Yerington (continued)

JR-71-15. Sericitized plagioclase phenocrysts in a groundmass of plagioclase, amphibole, chlorite, opaque minerals, and epidote.

JR-71-16. Sericitized plagioclase and amphibolitically-altered mafic phenocrysts in a groundmass of plagioclase, amphibole, quartz, sericite, opaque minerals, and epidote.

JR-71-17. Similar to sample 16 but with more mafic minerals.

JR-71-18. Similar to sample 16.

JR-71-19. Plagioclase phenocrysts altered to sericite, calcite, or epidote and mafic phenocrysts altered to biotite and opaque minerals; groundmass of plagioclase, quartz, biotite, opaque minerals, and epidote.

JR-71-20. Plagioclase phenocrysts in a groundmass of plagioclase, biotite, opaque minerals, and minor quartz.

JR-71-21. Sericitized plagioclase and minor quartz phenocrysts in a groundmass of plagioclase, quartz, sericite, biotite, chlorite, and opaque minerals.

JR-71-22. Aphyric. Consists of plagioclase, chlorite, biotite, quartz, epidote, and opaque minerals.

JR-71-23. Sericitized plagioclase and some altered mafic phenocrysts in a groundmass of plagioclase, sericite, chlorite, biotite, epidote, and opaque minerals.

JR-71-24. Sericitized plagioclase and amphibolitically-altered mafic phenocrysts in a groundmass of plagioclase, chlorite, biotite, amphibole, sericite, opaque minerals, and minor epidote and quartz.

JR-71-25. Nearly aphyric. Consists of plagioclase, biotite, chlorite, sericite, opaque minerals, and minor epidote and quartz.

JR-71-26. Similar to sample 25.

JR-71-27. Sericitized plagioclase phenocrysts in a groundmass of plagioclase, biotite, chlorite, sericite,and opaque minerals; minor quartz, epidote, and calcite.

Pine Nut Range Triassic-Jurassic

Samples PN-1, 2, 2a, 3, and 3a were collected by G.C. Dunne in the Veta Grande Andesite along the crest of the Pine Nut Range on the eastern side of Red Canyon, Douglas County, Nevada. PN-1 is from the highest exposed strata, PN-2 and 2a are from 800 feet lower, and PN-3 and 3a are from member 2, near the base of the Veta Grande unit (Noble, 1962).

PN-1. Porphyritic and glomeroporphyritic with phenocrysts of sericitized plagioclase and mafic minerals altered to hornblende, epidote, and chlorite. Groundmass of feldspar, quartz, hornblende, epidote, and opaque minerals.

PN-2 and 2a. Sericitized plagioclase and amphibolitically-altered pyroxene phenocrysts in a groundmass of plagioclase, biotite, amphibole, and opaque minerals.

PN-3 and 3a. Lithic-crystal tuff consisting of fragments of plagioclase and minor quartz, K-feldspar, altered biotite, and silicic volcanic rocks, in a recrystallized matrix of quartz, feldspar, sericite, biotite, and opaque minerals.

Genoa Triassic-Jurassic

JR-71-28, 31, 32, and 33 were collected in a JTrv outcrop just south of Genoa, Nevada, where the outcrop is along the west side of the road from Minden to Genoa (Moore, 1961).

JR-71-28 has a metamorphosed clastic texture, possibly representing a former andesitic tuff or epiclastic rock. Plagioclase grains and very minor quartz in a matrix of plagioclase, sericite, biotite, etc.

JR-71-31. Similar to sample 28.

JR-71-32. Large grains of plagioclase (slightly altered to sericite and calcite) and fibrous green amphibole (altering earlier ferromagnesian minerals); matrix of interlocking, anhedral, plagioclase grains with some biotite, chlorite, quartz, and opaque minerals. Possibly originally a brecciated andesite.

JR-71-33.Inequigranular rock with large plagioclase crystals and smaller light brown biotite and light green hornblende grains. Fine-grained material is generally plagioclase, biotite, and opaque minerals. Some intergrowth textures in plagioclase. Possibly either a metamorphosed andesite breccia or a sheared and recrystallized shallow intrusive rock.

Carson City Triassic-Jurassic

JR-71-34, 35, 36, 38, and 39 were collected from a JTrv outcrop just west of U. S. Highway 395 at the southwestern edge of Carson City, Nevada (Moore, 1961).

JR-71-34, 35, 36, 38, and 39 are plagioclase-hornblende rocks showing anhedral, intergrown, textures and considerable variation in grain size. The rocks were apparently originally porphyritic with phenocrysts of plagioclase and clinopyroxene (which can be found as relicts in some samples). Calcitic alteration ranges from slight to abundant.

Peavine Group

JR-71-40, 41, and 46 were collected from an outcrop mapped as a metavolcanic portion of the Peavine sequence by Bonham (1969). The outcrop is on the eastern side of Cold Spring Valley, T21N R19E, northwest of Reno, Nevada.

JR-71-40. Zoned plagioclase phenocrysts in a matrix of feldspar, biotite, hornblende, opaque minerals, and minor quartz; some large quartz grains.

JR-71-41. Volcaniclastic or epiclastic. Large plagioclase and quartz grains in a matrix of chlorite, sericite, feldspar, opaque minerals; some areas of epidote.

JR-71-46. Plagioclase phenocrysts in a matrix of feldspar, chlorite, biotite, sericite, quartz, and opaque minerals; some large areas of epidote may be relict amygdules.

Devil's Postpile Area

JR-72-17 to 23 were collected from an outcrop of JTrv (Huber and Rinehart, 1965) in the Shadow Crest and Mammoth Creek sequence. Samples are along the road north of Devil"s Postpile at approximately Lat. 37°40′N, Long. 119°05′W.

JR-72-17 and 19 to 23 are all schistose metavolcanics or metavolcanic tuffs. Samples contain large, irregularly-shaped grains in a fine-grained groundmass. The large grains appear to be relict phenocrysts (some are embayed quartz) and consist of quartz, plagioclase, ± K-feldspar. Groundmass consists of quartz, feldspar, biotite, sericite, chlorite, opaque minerals, epidote, and minor tourmaline.

JR-72-18. Schistose, metavolcanic rock consisting of plagioclase, light green amphibole, epidote, biotite, quartz, and opaque minerals.

San Andreas

JR-72-10 to 16 were collected from outcrops of uncertainly dated metavolcanic rocks of greenschist facies north and west of Altaville in the San Andreas Quadrangle, California (Clark and others, 1963).

JR-72-10. Schistose, fine grained. Consists of quartz, plagioclase (albite), light green amphibole, chlorite, biotite, epidote, and minor calcite. Some thin veins of epidote, calcite, and quartz.

JR-72-11. Very fine-grained, metamorphosed, crystal-lithic (?) tuff with some preservation of original clastic texture. Consists of plagioclase (albite), chlorite, epidote, amphibole, and minor quartz.

JR-72-12. Schistose, fine grained. Consists of feldspar (mostly plagioclase ?), muscovite, quartz, epidote, chlorite, and calcite.

JR-72-13. Very similar to sample 12 plus some light green amphibole.

JR-72-14 to 16. Schistose, with relict phenocrysts of sericitized plagioclase, groundmass of plagioclase (partly saussuritized). chlorite, epidote, sericite, quartz, and potash feldspar. Some thin stringers of quartz.

Individual Chemical Analyses

Valmy

JR-71-	50	51	153	161	49	52	55	56
SiO_2	43.1	40.8	46.3	45.1	50.8	50.5	48.5	48.7
TiO_2	2.8	2.3	1.5	1.5	0.8	0.9	0.9	0.8
Al_2O_3	10.0	8.4	10.3	13.6	12.5	13.0	11.3	10.6
Fe_2O_3	15.2	13.1	9.8	11.5	8.9	10.0	8.8	8.6
MgO	9.0	8.9	7.2	7.9	10.0	6.6	7.7	7.7
CaO	6.3	13.3	12.4	11.3	6.2	7.6	8.7	12.0
Na_2O	3.5	2.4	4.0	3.6	2.6	1.3	1.8	2.8
K_2O	0.1	0.0	0.1	0.1	2.6	3.5	2.4	1.9
H_2O		11.4	8.5		6.4		8.1	6.1

Schoonover

JR-71-	181	182	183	184	185
SiO_2	42.9	41.9	44.2	42.0	37.3
TiO_2	2.3	4.0	4.2	3.0	2.9
Al_2O_3	12.4	11.4	11.4	14.8	10.9
Fe_2O_3	12.3	19.1	13.4	14.8	16.1
MgO	8.6	6.7	5.5	6.7	9.0
CaO	8.2	5.5	5.2	3.2	9.4
Na_2O	4.5	4.7	5.0	5.8	3.9
K_2O	0.2	0.1	0.1	0.5	0.0
H_2O	8.5	7.5	8.4	8.0	

Pumpernickel

JR-71-	84	85	86	87	88	89	90	91	92
SiO_2	45.8	46.6	47.5	45.1	46.3	46.9	47.2	46.0	43.6
TiO_2	1.6	1.4	1.5	1.5	1.7	2.1	1.6	1.9	1.7
Al_2O_3	12.9	11.8	12.9	12.5	11.7	10.2	10.5	11.2	10.2
Fe_2O_3	13.3	12.0	11.2	12.8	13.3	14.8	13.4	13.7	14.4
MgO	6.5	7.8	7.3	7.6	8.8	7.7	8.7	8.9	10.3
CaO	11.1	12.9	11.6	11.6	10.5	10.2	11.0	9.5	13.6
Na_2O	2.8	2.8	3.3	2.7	3.3	3.7	3.2	3.8	1.4
K_2O	0.1	0.0	0.0	0.1	0.3	0.4	0.4	0.2	0.4
H_2O		6.3			4.6		6.2		

Farrell Canyon

JR-71-	100	102	103	105
SiO_2	39.8	45.8	41.3	43.6
TiO_2	1.8	2.0	1.6	1.0
Al_2O_3	13.1	12.2	12.6	11.9
Fe_2O_3	11.9	11.1	12.7	10.4
MgO	8.7	9.0	14.0	13.5
CaO	9.2	9.4	7.4	10.2
Na_2O	5.0	4.7	3.0	4.3
K_2O	0.9	0.1	0.3	0.3
H_2O	8.2	5.9	6.8	3.5

Happy Creek

JR-71-	58	59	60	61	62	63	64
SiO_2	50.8	50.0	51.0	52.0	49.6	48.4	50.0
TiO_2	1.0	1.0	0.9	0.8	0.9	1.0	0.6
Al_2O_3	16.7	17.0	15.8	16.0	15.4	15.7	16.0
Fe_2O_3	8.1	8.3	9.1	8.9	9.8	10.6	9.6
MgO	5.3	5.2	7.8	7.3	9.0	3.5	8.3
CaO	6.4	5.0	5.0	5.0	4.6	5.8	4.7
Na_2O	5.00	6.5	1.6	5.4	5.5	4.4	5.0
K_2O	2.6	1.4	1.3	1.0	0.8	1.4	1.0
H_2O		6.0	5.9	5.3		10.9	7.0

Jackson Mountains Triassic

JR-71-	65	66	67	68	69	70	71	72	73	74	75
SiO_2	48.1	50.2	48.6	47.0	46.9	45.1	43.0	42.2	52.8	52.5	45.8
TiO_2	0.7	0.2	0.9	0.9	0.8	0.8	0.8	0.7	0.5	0.5	0.7
Al_2O_3	12.1	11.6	13.4	13.2	11.2	13.1	14.0	14.5	17.1	17.0	10.6
Fe_2O_3	12.6	11.1	12.9	12.7	12.9	12.4	12.7	13.3	9.7	9.8	11.5
MgO	9.2	7.9	8.8	9.4	10.1	9.1	9.4	8.7	3.8	3.7	8.4
CaO	9.8	8.4	7.6	7.6	9.9	9.5	10.2	12.8	6.5	6.7	10.4
Na_2O	2.1	3.4	3.5	3.5	3.3	3.3	2.5	0.7	4.3	4.0	2.3
K_2O	2.1	2.0	1.0	1.1	0.4	1.2	1.2	1.7	2.2	2.1	0.8
H_2O	3.1							7.1			11.2

Excelsior

data from Talukdar (1972)

Soda Mountains and Warm Springs

data from Abbott (1972)

Gillis

data from Talukdar (1972)

Bodie Hills Triassic

JR-72-	24	25	26	27
SiO_2	57.0	56.8	51.4	52.7
TiO_2	0.3	0.3	0.3	0.3
Al_2O_3	12.9	12.0	11.9	10.5
Fe_2O_3	5.4	6.9	9.8	10.0
MgO	8.9	9.3	13.3	13.3
CaO	6.4	7.5	8.9	10.5
Na_2O	4.4	4.2	2.7	2.4
K_2O	0.2	0.4	1.1	0.6

Yerington Triassic

JR-71-	1	2	3	4	5	6	7	8	9	10
SiO_2	60.2	68.2	58.6	49.7	53.2	72.9	52.0	59.4	56.8	49.0
TiO_2	0.8	0.4	0.8	1.2	0.9	0.3	1.2	1.2	0.9	1.1
Al_2O_3	15.7	15.8	17.0	17.8	15.5	14.7	15.2	14.8	15.8	15.2
Fe_2O_3	8.0	2.9	8.6	8.9	9.3	2.3	9.6	8.6	9.1	11.3
MgO	4.5	1.9	2.7	6.4	6.4	1.7	7.5	5.9	4.1	8.4
CaO	6.7	2.4	4.3	6.6	5.2	1.9	5.7	4.0	4.9	5.7
Na_2O	2.4	4.2	1.2	3.6	6.2	4.5	4.0	1.1	4.8	3.8
K_2O	2.0	3.9	6.5	3.2	1.5	2.7	3.0	2.7	2.0	2.2
H_2O	2.4									3.3

Yerington Triassic (continued)

JR-71-	11	12	13	14	15	16	17	18	19	20
SiO_2	55.7	55.1	56.0	68.5	52.0	58.0	53.0	58.7	53.4	58.7
TiO_2	0.8	0.8	0.8	0.5	0.9	0.8	1.1	1.0	1.3	1.4
Al_2O_3	16.9	15.3	15.6	15.7	15.6	15.6	14.3	14.2	16.3	17.1
Fe_2O_3	9.6	8.8	8.9	1.4	8.9	8.4	8.1	9.6	9.1	6.8
MgO	3.3	6.6	5.3	1.3	5.1	3.1	7.4	5.0	6.5	1.8
CaO	4.7	6.0	5.7	3.2	8.8	5.3	10.5	9.5	7.3	4.1
Na_2O	3.1	3.4	2.8	4.2	4.0	4.1	2.6	1.4	3.0	4.3
K_2O	4.7	2.9	3.1	4.2	1.3	2.8	1.8	2.1	2.0	4.1
H_2O										2.2

Yerington Triassic (continued)

JR-71-	21	22	23	24	25	26	27
SiO_2	61.7	60.4	55.9	56.9	59.6	56.3	52.4
TiO_2	1.2	1.1	0.9	0.8	0.9	0.9	1.3
Al_2O_3	16.3	15.3	18.2	16.2	17.0	17.3	16.0
Fe_2O_3	7.4	7.8	7.3	9.2	8.3	8.8	10.5
MgO	1.6	5.0	2.7	4.8	3.0	3.3	5.6
CaO	3.7	3.9	6.6	8.2	4.0	5.0	4.0
Na_2O	2.1	0.4	3.1	3.4	4.7	4.6	5.0
K_2O	3.4	5.4	3.0	0.6	2.1	1.8	2.5

Pine Nut Range Triassic-Jurassic

	PN-1	PN-2	PN-2a	PN-3	PN-3a
SiO_2	57.3	49.9	48.4	63.2	71.5
TiO_2	0.7	1.0	1.1	0.7	0.5
Al_2O_3	15.9	16.1	16.3	14.2	13.5
Fe_2O_3	6.3	9.6	10.1	5.5	3.4
MgO	3.9	5.5	6.1	4.8	3.4
CaO	6.1	7.4	7.1	2.9	1.1
Na_2O	3.3	2.8	2.7	2.7	2.8
K_2O	4.2	2.3	3.0	3.6	3.5

Genoa Triassic-Jurassic

JR-71-	28	31	32	33
SiO_2	56.5	56.6	58.8	63.0
TiO_2	0.8	0.8	1.1	0.8
Al_2O_3	15.7	15.5	15.2	15.3
Fe_2O_3	7.3	7.2	7.9	5.6
MgO	5.4	7.2	3.4	2.2
CaO	3.8	3.3	6.0	4.4
Na_2O	4.3	4.5	4.4	3.7
K_2O	2.8	2.1	1.6	3.0
H_2O		4.2		

Carson City Triassic-Jurassic

JR-71-	34	35	36	38	39
SiO_2	38.9	45.1	40.1	49.5	44.4
TiO_2	1.0	1.0	1.0	0.9	1.1
Al_2O_3	14.2	16.0	14.3	15.0	15.5
Fe_2O_3	10.0	11.6	7.1	9.4	11.8
MgO	4.7	4.3	3.4	6.8	6.5
CaO	19.8	13.8	21.7	5.3	13.5
Na_2O	2.6	2.6	3.4	2.2	3.1
K_2O	0.6	0.9	0.1	0.1	0.6
H_2O		4.0			

Peavine Group

JR-71-	40	41	46
SiO_2	55.4	62.0	65.0
TiO_2	0.9	0.6	0.8
Al_2O_3	15.8	15.6	14.9
Fe_2O_3	8.8	6.2	6.2
MgO	4.5	3.2	2.9
CaO	6.6	3.7	3.7
Na_2O	2.0	3.6	2.6
K_2O	2.2	3.3	4.3
H_2O	2.9		

Devil's Postpile Area

JR-72-	17	18	19	20	21	22	23
SiO_2	62.2	55.8	73.5	75.1	74.4	67.5	74.8
TiO_2	0.7	0.9	0.2	0.2	0.2	0.2	0.2
Al_2O_3	16.4	15.3	14.6	14.4	14.5	14.5	15.9
Fe_2O_3	6.4	10.7	2.2	1.4	2.1	2.1	1.8
MgO	1.6	3.9	1.1	1.5	0.9	1.0	1.2
CaO	4.1	6.8	1.2	1.9	1.3	1.4	1.4
Na_2O	2.2	2.9	3.4	2.1	2.4	2.7	1.3
K_2O	4.5	2.1	4.4	5.1	5.4	5.5	5.4

San Andreas Area

JR-72-	10	11	12	13	14	15	16
SiO_2	54.7	54.5	58.1	53.1	54.1	57.2	56.0
TiO_2	0.9	1.0	0.3	1.0	0.5	0.5	0.6
Al_2O_3	11.2	12.4	16.7	12.6	17.2	17.0	15.3
Fe_2O_3	12.6	12.0	6.0	11.3	6.3	6.1	6.6
MgO	5.0	4.7	3.2	6.9	5.6	3.9	8.4
CaO	11.6	11.5	5.1	10.1	7.4	6.2	7.0
Na_2O	3.2	2.8	3.8	3.8	3.2	4.0	3.6
K_2O	0.1	0.1	1.7	0.2	0.9	0.8	0.3