

Strontium, Lead, and Oxygen Isotopic Data for Granitoid and Volcanic Rocks from the Northern Great Basin and Sierra Nevada, California, Nevada and Utah

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Open-File Report 99-569

1999

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**U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY**

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INTRODUCTION

A Pb isotopic study of Mesozoic and Tertiary granitoid and some Tertiary volcanic rocks that had been investigated previously for their initial $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic values in the northern Great Basin (e.g. Kistler and Lee, 1989; Robinson and Kistler, 1986) has been completed and interpreted with respect to regional crustal structure and to the occurrence of gold deposits (Wooden and others, 1998). The values of initial $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, and $^{208}\text{Pb}/^{204}\text{Pb}$ of the igneous rocks are systematically variable, and the northern Great Basin is divided into western, central, and eastern crustal provinces based on the geographic distribution of characteristic Sr and Pb isotopic values (Figure 1). The boundary between the western and central crustal provinces closely follows the previously documented initial $^{87}\text{Sr}/^{86}\text{Sr}=0.706$ line (e.g. Kistler, 1991) and represents a narrow zone in which initial Pb and Sr isotopic ratios increase rapidly. Initial Pb and Sr isotopic ratios are strongly correlated, generally increasing from west to east across these two provinces. In contrast, the eastern province is characterized by plutons that are not strongly correlated isotopically and that have more variable isotopic ratios than those to the west. The boundary between the central and eastern Pb isotopic provinces is sharp, and it is approximately coincident with the Carlin gold belt in north-central Nevada. We suggest, this isotopic boundary and the gold belt mark the locus of a cryptic major crustal fault. The Battle Mountain-Eureka or Cortez trend of gold mineralization lies within the central isotopic province and is generally parallel to both the Carlin trend and the N-S oriented portion of the boundary between the western and central provinces (the $\text{ISr}=0.706$ line). It is proposed that all three of these features are related to faults formed during the major period of continent-scale rifting that affected western North America in the late Precambrian and were reactivated or utilized by later tectonic and magmatic events in the Phanerozoic. This report gives the locations and isotopic data that were used to derive the conclusions stated above. Where available for these specimens, oxygen isotopic data are also compiled in this report.

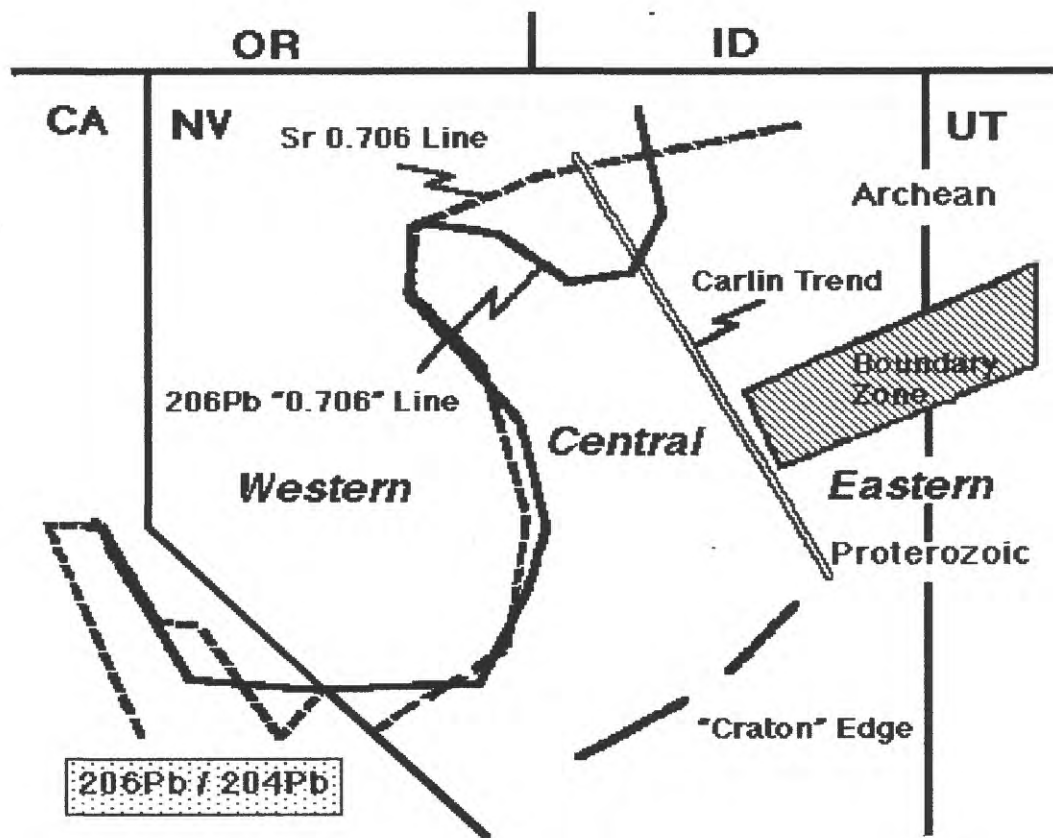


Figure 1. Map of the crustal boundaries and regions defined by initial $^{206}\text{Pb}/^{204}\text{Pb}$ for plutons in Nevada and adjoining parts of California and Utah and a comparison to the previously defined initial $^{87}\text{Sr}/^{86}\text{Sr}=0.706$ line and to the Carlin trend. The break between Archean and Proterozoic crust in the eastern province is not defined clearly and probably represents a gradational boundary (modified from Wooden and others, 1998).

ANALYTICAL METHODS

The Sr isotopic data tabulated herein have been gathered over more than 20 years, mostly in the Sr isotope laboratory at the USGS in Menlo Park, California. Results are presented for whole-rock granitoid powders milled to less than 200 mesh (e.g. Kistler and Lee, 1989). Strontium isotopic compositions were determined on two different mass spectrometers and are normalized to $^{86}\text{Sr}/^{88}\text{Sr}=0.1194$. Measurements of NBS strontium carbonate standard SRM 987 yield a mean $^{87}\text{Sr}/^{86}\text{Sr}$ of 0.710239 ± 0.000015 over this period. The decay constant for rubidium used to calculate the initial $^{87}\text{Sr}/^{86}\text{Sr}$ values reported in Table 1 is from Steiger and Jager (1977). Analytical uncertainties in whole-rock $^{87}\text{Sr}/^{86}\text{Sr}$ values are about $\pm 0.008\%$. However, we report initial $^{87}\text{Sr}/^{86}\text{Sr}$ values to only $\pm 0.014\%$ (1 in the 4th place) because of uncertainties in ages assigned to many of the plutons investigated in this study. Strontium data from other labs is referenced in Table 1.

Oxygen isotope compositions for samples beginning with GR in Table 1 are from Lee and others (1981). The other oxygen isotope compositions were determined by the BrF_5 technique of Clayton and Mayeda (1963), using conventional isotope ratio mass spectrometry in the USGS stable isotope laboratory of the late Ivan Barnes. All of the δ -values are given in permil relative to the SMOW standard. All samples were analyzed in duplicate with reproducibility of $\delta^{18}\text{O}$ of ± 0.15 permil or better.

The Pb isotope data have been determined over about a ten year period in the Pb isotopic laboratory at the U.S. Geological Survey in Menlo Park for a number of topical studies (e. g. Wright and Wooden, 1991) focused primarily on magmatic and tectonic histories and processes. Most of the initial lead isotopic compositions were obtained on feldspar separates made from whole-rock crushes by conventional magnetic and heavy-liquid separation techniques. Sodium and particularly K-rich feldspars from granitoid rocks have relatively high concentrations of Pb and very low concentrations of U and Th. For "GR" samples the present-day Pb isotopic composition of the whole-rock powder has been determined along with a Pb concentration by the isotope dilution technique. These data have been combined with U and Th concentration and crystallization age data (Lee, 1984; Kistler and Lee, 1989) to calculate an initial Pb isotopic composition for each specimen.

Pb was separated from feldspar and whole-rock samples using standard anion exchange resin processes that utilize HBr and HCl. All feldspar mineral separates were leached with HCl, HNO_3 , and weak HF to

remove labile Pb before dissolution. Pb isotopic compositions were determined in static-collection mode on a MAT 262 mass spectrometer. Thermal fractionation is monitored by running NBS-981 and -982. The empirically determined fractionation correction factor is 0.0011 per mass unit and its uncertainty is the largest contribution to the total analytical uncertainty of about 0.1% associated with the Pb isotopic ratios.

Data are given in two tables: Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and oxygen Isotopic Data; Table 2. Northern Great Basin Pb Isotopic data.

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Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic Data									
Sample Number	Name (State)	Declat	Declong	^{206}Pb	^{207}Pb	^{208}Pb	Age (Ma)	Initial $^{87}\text{Sr}/^{86}\text{Sr}$	$\delta^{18}\text{O}$
(x)=reference				^{204}Pb	^{204}Pb	^{204}Pb			0/00
Alta Stock (2)	Wasatch Range(Utah)	40.58	111.63	17.891	15.596	38.306	35	0.7072	
Little Cottonwood Stock (2)	Wasatch Range (Utah)	40.58	111.65	17.600	15.560	38.282	31	0.7084	
Last Chance Stock(2)	Oquirrh Range (Utah)	40.42	112.08	17.549	15.570	38.205	38	0.7073	
GR-17 ** (1)	East Tintic (Utah)	39.90	112.12	18.696	15.622	38.767	38	0.7090	0.6
GR-1 ** (1)	Marysville (Utah)	38.50	112.18	18.606	15.584	38.420	21	0.7056	4.5
GR-15** (1)	Desert Mtn. (Utah)	39.72	112.60	18.839	15.634	38.707	38	0.7093	8
GR-5** (1)	Star Range (Utah)	38.34	113.07	18.458	15.578	38.840	22	0.7093	4.5
GR-11** (1)	Three Peaks Utah)	37.78	113.17	17.924	15.536	38.152	22	0.7072	8.2
GR-7** (1)	San Francisco Utah)	38.47	113.28	18.403	15.574	38.497	32	0.7063	7
Notch Peak (2)	House Range (Utah)	39.13	113.33	19.061	15.722	39.640	169	0.7069	
GR-9** (1)	Stoddard Mtn. (Utah)	37.57	113.35	17.731	15.533	38.210	32	0.7071	7.4
Newfoundland pluton (2)	Newfoundland Mountain (Utah)	41.23	113.38	19.602	15.761	40.116	160	0.7051	
GR-3** (1)	Notch Peak (Utah)	39.18	113.40	19.449	15.721	39.495	169	0.7060	9.3
biotite monzogranite	Immigrant Pass (Utah) (3)	41.50	113.60	17.749	15.643	38.057	38	0.7102	
hb-bi monzogranite	Immigrant Pass (Utah) (3)	41.50	113.60	17.023	15.540	37.822	38	0.7097	
hb-bi qtz. diorite	Immigrant Pass (Utah) (3)	41.50	113.60	16.893	15.474	37.562	38	0.7091	
Red Butte	Grouse Creek Range (Utah) (3)	41.75	113.63	17.507	15.649	38.379	25	0.7156	
Ibapah pluton(2)	Deep Creek Range (Utah)	39.66	113.66	19.108	15.778	39.986	39	0.7166	
Ibapah pluton(2)	Deep Creek Range (Utah)	39.66	113.66	19.092	15.757	39.910	39	0.7166	
GR-93** (1)	Gold Hill (Utah)	40.15	113.75	19.277	15.816	40.550	155	0.7096	6.7
Crater Island (2)	Silver Island Mountains (Utah)	41.30	113.75	19.603	15.773	40.119	160	0.7056	
Crater Island (2)	Silver Island Mountains (Utah)	41.30	113.75	19.636	15.793	40.165	160	0.7060	
GR-21** (1)	Grouse Creek (Utah)	41.53	113.77	17.676	15.631	38.149	38	0.7113	7.6
GR-91bar** (1)	Deep Creek (Utah)	39.85	113.80	19.104	15.753	39.877	38	0.7140	
GR-91** (1)	Deep Creek (Utah)	39.85	113.80	19.112	15.759	39.915	38	0.7140	9.6
19 (4)	Gold Hill (Utah)	40.13	113.79	19.568	15.812	40.139	152	0.7080	
41(4)	Gold Hill (Utah)	40.17	113.81	18.915	15.791	40.194	38	0.7150	
10 (4)	Gold Hill (Utah)	40.16	113.81	19.733	15.860	40.366	152	0.7090	
42 (4)	Gold Hill (Utah)	40.18	113.82	19.976	15.862	40.682	152	0.7090	
38B (4)	Gold Hill (Utah)	40.17	113.82	18.731	15.772	40.075	38	0.7150	
18 (4)	Gold Hill (Utah)	40.11	113.82	19.611	15.838	40.302	152	0.7090	
68-1 (4)	Gold Hill (Utah)	40.16	113.83	19.537	15.812	40.170	152	0.7090	
15A (4)	Gold Hill (Utah)	40.08	113.83	19.566	15.841	40.230	152	0.7090	
68-2 (4)	Gold Hill (Utah)	40.18	113.83	18.668	15.761	40.028	38	0.7150	

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic data (cont.)									
Sample Number (x)=reference	Name (State)	Declat	Declong	^{206}Pb ^{204}Pb	^{207}Pb ^{204}Pb	^{208}Pb ^{204}Pb	Age (Ma)	Initial $^{87}\text{Sr}/^{86}\text{Sr}$	$\delta^{18}\text{O}$ 0/00
13A (4)	Gold Hill (Utah)	40.16	113.83	19.645	15.832	40.173	152	0.7090	
5A (4)	Gold Hill (Utah)	40.18	113.83	18.685	15.726	39.908	38	0.7150	
6 (4)	Gold Hill (Utah)	40.19	113.85	18.658	15.758	39.996	38	0.7150	
70-2 (4)	Gold Hill (Utah)	40.19	113.88	18.713	15.774	40.079	38	0.7150	
GR-23** (1)	Pilot Range (Utah)	41.23	114.00	17.763	15.554	37.714	37	0.7071	7.9
M80PR-19 (2)	Miners Spring (Utah)	41.00	114.00	19.712	15.814	39.865	160	0.7104	
Uvada (2)	Kern Mountains (Nevada)	39.75	114.08	19.463	15.759	39.729	35	0.7145	
Skinner Canyon (2)	Kern Mountains (Nevada)	39.75	114.08	18.561	15.651	39.563	35	0.7114	
PBG-Km-42 (2)	Skinner Canyon Kern Mountains (Nevada)	39.75	114.08	18.551	15.685	39.509	35	na	
20-210 (2)	Snake Range-Horse Canyon (Nevada)	39.25	114.13	19.010	15.673	38.910	100	0.7070	
Old Man tonalite (2)	Snake Range (nevada)	39.25	114.17	19.231	15.752	39.665	160	0.7083	
BFU Silver Creek (2)	Snake Range (nevada)	39.15	114.17	19.574	15.766	39.563	160	0.7068	
GR-47** (1)	Lexington Creek pluton (Nevada)	38.85	114.20	18.746	15.631	39.105	86	0.7113	10.6
M80TR-01 (2)	Toano Springs 2-Mica granite (Nevada)	41.00	114.20	19.684	15.958	41.126	75	0.7251	
M84TR-81 (2)	Toano Springs 2-mica granite (Nevada)	41.00	114.20	19.556	15.903	40.900	75	0.7251	
Young Canyon (2)	Snake Range (Nevada)	38.97	114.20	18.228	15.664	39.286	37	0.7120	
PBGKm-71 (2)	Tungstonia Granite, Kern Mtns. (Nevada)	39.70	114.20	19.284	15.739	39.443	80	0.7211	
KTG (2)	Tungstonia Granite, Kern Mtns. (Nevada)	39.70	114.20	18.981	15.781	40.085	80	0.7211	
PBG-T7 (2)	Tungstonia Granite, Kern Mtns. (Nevada)	39.70	114.20	19.003	15.786	40.202	80	0.7211	
PBG4039 (2)	Tungstonia Granite, Kern Mtns. (Nevada)	39.70	114.20	19.065	15.792	40.177	80	0.7211	
16-72-3 (2)	Snake Creek pluton, Snake Range (Nevada)	38.93	114.25	19.241	15.712	39.292	155	0.7071	
GR-123** (1)	White Horse gran., Goshute Range	40.27	114.28	19.840	15.757	39.496	145	0.7070	10.4
White Horse pluton	Goshute Range (Nevada) (2)	40.27	114.28	19.584	15.760	39.720	145	0.7072	
N9-83	White Horse gran., Goshute Range	40.27	114.28	19.582	15.763	39.747	145	0.7071	9.5
N9C-83	White Horse gran., Goshute Range	40.27	114.28	19.557	15.751	39.774	145	0.7070	10.1
51-053-15 (2)	Oseceda pluton, Snake Range (Nevada)	39.07	114.28	19.187	15.729	39.321	145	0.7075	
GR-25** (1)	Toano Springs, 2-mica granite (Nevada)	41.00	114.30	19.723	15.939	41.146	80	0.7268	8.6
M83TR-36 (2)	bi. granodiorite, Silver Zone Pass	40.90	114.30	19.953	15.781	40.003	162	0.7052	
biot. granodiorite (2)	Silver Zone Pass (Nevada)	40.90	114.30	19.960	15.763	39.962	162	0.7052	
WC-2 (2)	Willard Creek gran., Snake Range	39.03	114.36	19.262	15.723	39.240	145	0.7088 (6)	
GR-119** (1)	Wilson Creek Range (Nevada)	38.30	114.47	18.153	15.571	39.098	38	0.7090	6.1
GR-125**	Dolly Varden pluton (Nevada)	40.35	114.55	19.615	15.777	39.979	150	0.7067	9.1
N11-83	Dolly Varden pluton (Nevada)	40.34	114.56	19.651	15.791	40.088	148	0.7064	8.7
N14-83	Dolly Varden pluton (Nevada)	40.34	114.59	19.506	15.744	39.675	148	0.7069	9.5

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic data (cont.)									
Sample Number (x)=reference	Name (State)	Declat	Declong	²⁰⁶ Pb	²⁰⁷ Pb	²⁰⁸ Pb	Age *	Initial	δ ¹⁸ O
M81PR-82 (2)	Bettridge Creek Granodiorite (Utah)	41.10	114.01	18.451	15.764	38.343	39	0.7110	
M79PR-116 (2)	McGinty Monzogranite Utah)	41.19	114.00	17.736	15.563	37.949	37	0.7072	
GR-128** (1)	Blind Mountain pluton (Nevada)	37.98	114.62	18.560	15.585	39.073	35	0.7076	8.2
PBG-107 (2)	Schell Creek Range (nevada)	39.50	114.75	19.064	15.715	39.679	35	0.7133	
Aurum (2)	Schell Creek Range (Nevada)	39.00	114.75	19.016	15.770	40.073	35	0.7196	
GR-57** (1)	Contact Pluton (Nevada)	41.75	114.77	19.799	15.741	39.458	155	0.7053	8.6
Contact pluton (2)	Granite Range (Nevada)	41.73	114.78	19.779	15.746	39.709	155	0.7054	
Melrose pluton (2)	Dolly Varden Mountains (Nevada)	40.27	114.78	19.802	15.804	40.404	158	0.7067	
EC-1 (2)	Egan Canyon, Cherry Creek Range (NV)	39.50	114.83	19.354	15.865	40.756	35	na	
WS-1 (2)	Warm Springs, Egan Range (Nevada)	39.63	114.90	18.987	15.752	40.115	35	0.7137	
Heusser Mtn. (2)	Egan Range (Nevada)	39.40	114.87	19.064	15.714	39.672	34	0.7134	
GR-19** (1)	Huesser mountain (Nevada)	39.40	114.87	19.030	15.687	39.574	34	0.7133	9.4
Ch-C#2 (2)	Cherry Creek Range (Nevada)	39.50	114.83	19.308	15.818	40.560	35	0.7137	
GR-45** (1)	Warm Springs, Egan Range (Nevada)	39.63	114.90	19.250	15.763	40.144	35	0.7117	8.6
RM-13 (7)	E. Humboldt Range (Nevada)	40.80	115.07	19.208	15.755	39.731	38	0.7104	
Angel Lake (7)	E. Humboldt Range (Nevada)	41.03	115.09	18.228	15.762	39.038	29	0.7138	
RM-5 (7)	Angel Lake, East Humboldt Range (Nevada)	41.03	115.09	19.558	15.929	40.688	29	0.7209	
AL-2 (7)	Angel Lake, East Humboldt Range (Nevada)	41.03	115.09	18.273	15.738	39.419	29	0.7200	
RM-12 (7)	East Humboldt Range (Nevada)	40.76	115.09	19.270	15.776	39.646	84	na	
RM-19 (7)	East Humboldt Range (Nevada)	41.00	115.09	17.816	15.627	39.012	38	0.7124	
RM-7 (7)	East Humboldt Range (Nevada)	40.82	115.12	18.279	15.757	39.958	39	na	
RM 11 (7)	Secret Peak, East Humboldt Range (NV)	40.82	115.26	19.252	15.918	40.548	32	0.7383	
RM-4 (7)	Lamolle Canyon, Ruby Range (Nevada)	40.64	115.37	19.586	15.793	39.758	80	0.7261	
RM-17 (7)	Lamolle Canyon, Ruby Range (Nevada)	40.66	115.41	19.150	15.672	38.943	29	0.7059	
RM-15 (7)	Lamolle Canyon, Ruby Range (Nevada)	40.66	115.44	19.232	15.711	39.580	29	0.7072	
GR-81** (1)	Silver Springs, White Pine Range (Nevada)	38.85	115.48	19.434	15.709	39.275	33	0.7114	10.8
GR-85** (1)	Harrison Pass pluton, Ruby Range (NV)	40.33	115.50	19.318	15.754	39.730	38	0.7110	9.8
Dawley Canyon (2)	Ruby Range (Nevada)	40.37	115.40	19.792	15.773	39.373	150	0.7111	
Lamolle Canyon (8)	Ruby Range (Nevada)	40.66	115.44	19.487	15.769	39.775	550	0.7070	14.0
R-2 (8)	Jurassic granite, Ruby Range (Nevada)	40.37	115.50	19.263	15.788	39.988	160	0.7137	11.6
RM-17-66 (8)	Dawley Canyon, Ruby Range (Nevada)	40.37	115.40	19.698	15.768	39.231	84	0.7370	14.9
J-1 Plagioclase (8)	Jurassic granite,Ruby Range (Nevada)	40.37	115.50	19.867	15.787	39.418	160	0.7137	
J-1 K-feldspar (8)	Jurassic granite,Ruby Range (Nevada)	40.37	115.50	19.785	15.746	39.303	160	0.7137	
RM-10 (8)	Jurassic granite, Ruby Range (Nevada)	40.33	115.50	19.940	15.768	39.634	160	0.7137	

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic data (cont.)									
Sample Number (x)=reference)	Name (State)	Declat	Declong	²⁰⁶ Pb	²⁰⁷ Pb	²⁰⁸ Pb	Age (Ma)	Initial ⁸⁷ Sr/ ⁸⁶ Sr	δ ¹⁸ O 0/00
S121-8	White Pine Peak, (Nevada)	38.86	115.50	19.363	15.703	39.192	33	0.7122	
S119-8	Little Bald Mountain (Nevada)	39.95	115.56	19.556	15.777	39.345	38	0.7104	
S123-8	Mt. Hamilton (Nevada)	39.25	115.56	19.426	15.728	39.050	98	0.7093	
GR-83** (1)	Grant Range, Troy Canyon (Nevada)	38.35	115.58	18.807	15.632	38.909	23	0.7110	11.1
GR-205** (1)	Worthington Mtn. (Nevada)	37.93	115.60	19.175	15.651	39.008	15	0.7098	8.3
GR-27** (1)	Coffee Pot pluton (Nevada)	41.80	115.63	18.984	15.630	38.553	90	0.7046	8.9
GR-117** (1)	Templute, (Nevada)	37.65	115.63	19.151	15.658	38.695	95	0.7075	10.8
RM-8 (7)	Harrison Pass pluton, Ruby Range(Nevada)	40.45	115.66	18.926	15.818	40.306	38	0.7110	
GR-97** (1)	Davis Canyon, Eureka County (Nevada)	40.02	115.83	19.335	15.684	39.025	35	0.7078	10.8
S117-8	Diamond Peak (Nevada)	40.02	115.84	19.525	15.702	39.229	37	0.7080	
GR-29** (1)	Golden Ensign pluton (Nevada)	41.82	115.93	18.928	15.623	38.652	90	0.7044	9.6
NS1D-9	SE Independence Mountains (Nevada)	41.12	115.96	19.193	15.663	38.810	39	0.7078	
NS1-9	Independence Mountains (Nevada)	41.12	115.96	18.672	15.699	39.244	39	0.7078	8.8
S126-8	Ruby Hill SW of Eureka (Nevada)	39.50	115.99	19.321	15.674	38.807	103	0.7062	
NEP-16	Oligocene grd	40.58	116.02	19.193	15.762	39.608	37	na	
GR-31 ** (1)	Columbia Stock (Nevada)	41.68	116.07	19.104	15.644	38.830	154	0.7045	7.8
GR-32** (1)	Columbia Stock (Nevada)	41.68	116.08	19.221	15.661	38.955	154	0.7047	
S125-8	Whistler Mtn apite (Nevada)	39.66	116.09	19.419	15.692	39.001	155	0.7087	
GR-59** (1)	White Rock pluton (Nevada)	41.70	116.15	19.844	15.792	39.217	155	0.7050	10.8
GR-35** (1)	Wood Cone Peak (Nevada)	39.38	116.15	19.504	15.706	39.090	38	0.7093	10.1
S127-8	Wood Cone Peak (Nevada)	39.38	116.15	19.549	15.729	39.270	38	0.7094	
GR-60** (1)	White Rock pluton (Nevada)	41.72	116.17	19.678	15.780	39.402	155	0.7050	
NS3-9	Buck Rake, S. Tuscarora Mtns. (Nevada)	40.61	116.26	19.905	15.731	39.647	39	0.7077	9.8
NS2-9	Northern Tuscarora Mtns. (Nevada)	41.33	116.33	19.094	15.679	39.105	39	0.7061	0.9
N16-83	Duff Creek pluton, Cortez Mtns. (Nevada)	40.34	116.35	21.354	15.835	40.769	155	0.7063	8.6
GR-103** (1)	Cortez Mountains (Nevada)	40.37	116.35	19.523	15.713	38.952	155	0.7072	9.4
GR-105** (1)	Cortez Mountains (Nevada)	40.33	116.40	18.929	15.669	38.777	155	0.7062	9.9
N31-83 Cottonwood Can.	granodiorite, Cortez Mtns. (Nevada)	40.26	116.44	24.996	15.960	46.898	155	0.7061	8.2
N30-83 Cottonwood Can.	granodiorite, Cortez Mtns. (Nevada)	40.27	116.45	19.636	15.694	39.299	155	0.7061	9.2
Cottonwood Canyon	granodiorite, Cortez Mtns. (Nevada)	40.27	116.45	19.832	15.711	39.330	155	0.7060	
N29-83 Cottonwood Can.	granodiorite, Cortez Mtns. (Nevada)	40.27	116.45	19.675	15.726	39.291	155	0.7061	9
GR-95** (1)	Simpson Park Mountains (Nevada)	39.92	116.55	19.356	15.684	39.004	33	0.7074	4.8
NS4-9	SW Cortez Mountains (Nevada)	40.20	116.60	19.445	15.715	39.031	154	0.7100	10.9
NS5-9	Shoshone Range (Nevada)	40.41	116.78	19.335	15.681	39.038	39	0.7078	6.7

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic Data (cont.)									
Sample Number (x)=reference	Name (State)	Declat	Declong	^{206}Pb ^{207}Pb ^{208}Pb			Age (Ma)	Initial $^{87}\text{Sr}/^{86}\text{Sr}$	$\delta^{18}\text{O}$ 0/00
GR-113** (1)	Northumberland, Toquima Range (Nevada)	38.95	116.83	19.056	15.639	38.584	155	0.7055	10.4
82DJ-181E	Northumberland, Toquima Range (Nevada)	38.96	116.87	19.215	15.673	38.817	155	0.7056	
GR-111** (1)	Belmont pluton, Toquima Range (Nevada)	38.57	116.88	18.953	15.653	38.769	85	0.7061	11
N5-83	Belmont pluton II, Toquima Range (Nevada)	38.60	116.90	19.212	15.669	38.900	85	0.7072	11.5
N4-83	Belmont pluton I, Toquima Range (Nevada)	38.56	116.91	19.159	15.671	38.842	84	0.7063	10.6
Birch Cr. pluton (2)	two mica granite, Toiyabe Range (Nevada)	39.50	116.92	19.188	15.687	38.951	84	0.7077	
Iowa pluton (2)	granodiorite, Toiyabe Range (Nevada)	39.83	117.00	19.302	15.689	38.940	84	0.7076	
Austin pluton (2)	granodiorite, Toiyabe Range (Nevada)	39.50	117.00	19.250	15.677	38.875	142	0.7070	
GR-109** (1)	Pipe Springs pluton, Toquima R. (Nevada)	38.52	117.02	19.090	15.636	38.677	80	0.7058	10.1
82DJ-190	North Round Mtn., Toquima Range (NV)	38.72	117.02	19.230	15.660	38.879	33	0.7077	10.4
Round Mtn. (2)	monzogranite, Toquima Range (Nevada)	38.72	117.02	19.131	15.669	38.849	90	0.7065	
N8-83	Round Mtn. pluton, Toquima Range (NV)	38.70	117.03	19.155	15.680	38.883	90	0.7065	9.7
N6-83	Pipe Springs pluton, Toquima R. (Nevada)	38.49	117.07	19.073	15.654	38.790	80	0.7059	9.5
DLS 86-119 (2)	Carseley Cr. gran., Toiyabe R. (Nevada)	39.33	117.08	19.324	15.688	38.998	77	0.7087	
Aiken Creek (2)	granodiorite, Toiyabe Range (Nevada)	39.16	117.08	18.992	15.645	38.706	90	0.7058	
DLS 86-166 (2)	Timblin Ck. granite, Toiyabe R. (Nevada)	39.00	117.16	19.051	15.657	38.734	92	0.7054	
NS10-9	Trenton Canyon stock, Battle Mtn. (NV)	40.63	117.20	19.191	15.674	38.838	89	0.7056	11.3
GR-107** (1)	Black Mtn., San Antonio Mtn. (Nevada)	38.15	117.20	19.020	15.678	38.781	200	0.7056	3.7
N3-83	Black Mtn., San Antonio Mtn. (Nevada)	38.15	117.22	19.254	15.696	38.835	200	0.7052	4.3
Fraziers Well (2)	Black Mtn., San Antonio Mtn. (Nevada)	38.15	117.22	19.254	15.696	38.835	200	na	
NS6-9	McCoy stock, Fish Creek Mtn. (Nevada)	40.30	117.24	19.527	15.713	39.090	153	0.7073	10.2
NS6-9 (duplicate)	McCoy stock, Fish Creek Mtns. (Nevada)	40.30	117.24	19.544	15.719	39.125	153	0.7073	10.2
NS9-9	Osgood Mountains stock (Nevada)	41.18	117.27	19.073	15.685	38.867	92	0.7061	10.5
NS7-9	Cain Creek stock, Shoshone Mtns. (NV)	40.01	117.27	19.489	15.718	39.058	159	0.7097	10.8
DLS 86-182 (2)	Ophir pluton, Toiyabe Range (Nevada)	38.95	117.30	19.079	15.653	38.745	96	0.7055	
DLS 86-234 (2)	Ravenwood pluton, Shoshone R. (Nevada)	39.75	117.30	19.060	15.635	38.731	85	0.7058	
82DJ-243	Ophir pluton, Toiyabe Range (Nevada)	38.95	117.32	18.967	15.630	38.621	96	0.7050	9.5
82DJ-272	Jett Canyon dike, Toiyabe Range (Nevada)	38.72	117.33	19.164	15.660	38.866	31	0.7042	2.4
N32-83	hbde-biot. grano., Edna Mtns. (Nevada)	40.82	117.44	19.316	15.687	38.839	109	0.7058	9.1
N32-83 bar	hbde-biot. grano., Edna Mtns. (Nevada)	40.82	117.44	19.298	15.681	38.889	109	0.7058	9.1
N33-83	Buffalo Mountain syenite (Nevada)	40.70	117.45	19.322	15.678	38.917	159	0.7057	9
Buffalo Mountain (2)	syenite (Nevada)	40.70	117.45	19.430	15.693	39.035	159	0.7058	
N33-83 bar	Buffalo Mountain syenite (Nevada)	40.71	117.45	19.318	15.678	38.913	159	0.7057	9
N1-83	Lone Mountain pluton (Nevada)	38.02	117.47	19.011	15.664	38.879	85	0.7072	9.4

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic Data (cont.)									
Sample Number	Name (State)	Declat	Declong	²⁰⁶ Pb	²⁰⁷ Pb	²⁰⁸ Pb	Age (Ma)	Initial ⁸⁷ Sr/ ⁸⁶ Sr	δ ¹⁸ O 0/00
(x)=reference				²⁰⁴ Pb	²⁰⁴ Pb	²⁰⁴ Pb			
NS8A-9	SW Fish Creek Mountains (Nevada)	40.17	117.47	19.190	15.659	38.885	70	0.7056	6.4
NS8A-9 bar	SW Fish Creek Mountains (Nevada)	40.17	117.47	19.203	15.665	38.913	70	0.7056	6.4
NS8B-9	SW Fish Creek Mountains (Nevada)	40.17	117.47	19.210	15.653	38.893	70	0.7056	6.5
GR-49** (1)	Weepah pluton (Nevada)	37.95	117.52	19.224	15.654	38.964	18	0.7063	9.8
84DJ-167	Crow Springs, SW Royston Hills (Nevada)	38.24	117.54	19.374	15.711	38.945	210	0.7054	
Tobin (9)	S. Tobin Range (Nevada)	40.21	117.61	19.370	15.688	39.103	150	0.7061	
82DJ-119	Orizaba Mine, N. Royston Hills (Nevada)	38.51	117.62	19.167	15.668	38.888	100	0.7047	5.7
GR-79** (1)	Santa Rosa pluton (Nevada)	41.55	117.65	19.016	15.626	38.621	100	0.7047	8.7
GR-77** (1)	Bloody Run pluton (Nevada)	41.17	117.73	19.016	15.634	38.650	90	0.7051	9.7
P4K-7 (9)	Lee Peak pluton, East Range (Nevada)	40.57	117.75	19.430	15.724	39.180	153	0.7094	
P4K8 (9)	Lee Peak pluton, East Range (Nevada)	40.57	117.75	19.439	15.697	39.099	153	0.7087	
P4K12 (9)	Lee Peak pluton, East Range (Nevada)	40.57	117.75	19.395	15.745	39.295	153	0.7085	
P2K8 (9)	Goldbank A pluton, East Range (Nevada)	40.57	117.76	19.495	15.720	39.191	150?	0.7065	
P2K5 (9)	Goldbank A pluton, East Range (Nevada)	40.57	117.76	19.466	15.752	39.200	150?	0.7065	
P3K1 (9)	Goldbank B pluton, East Range (Nevada)	40.54	117.77	19.424	15.710	39.017	150?	0.7058	
P3K3 (9)	Goldbank B pluton, East Range (Nevada)	40.54	117.77	19.442	15.717	39.048	150?	0.7060	
82DJ-74	North Cedar Mountain pluton (Nevada)	38.55	117.80	19.012	15.642	38.728	100?	0.7044	7.7
G.Mtn. (9)	Granite Mtn, S. East Range(Nevada)	40.30	117.80	19.104	15.647	38.815	30	0.7054	
G.Mtn. (9)	Triassic pluton, S. East Range (Nevada)	40.30	117.80	19.880	15.731	39.484	215	0.7050	
GR-51** (1)	Palmetto Wash pluton (Nevada)	37.53	117.80	18.723	15.641	38.602	155	0.7071	8.9
82DJ-72	North Cedar Mountain pluton (Nevada)	38.56	117.83	19.068	15.638	38.756	100?	0.7041	8
P6K8 (9)	Grass Valley pluton, East Range (Nevada)	40.85	117.84	19.380	15.697	38.990	140	0.7049	
P4K4 (9)	Lee Peak pluton, East Range (Nevada)	40.57	117.85	19.402	15.708	39.118	153	0.7094	
P4K1 (9)	Lee Peak pluton, East Range (Nevada)	40.57	117.85	19.484	15.740	39.184	153	0.7083	
P1K3 (9)	Rockhill Can. pluton, East Range (Nevada)	40.63	117.88	19.500	15.711	39.215	169	0.7089	
P1K1 (9)	Rockhill Can. pluton, East Range (Nevada)	40.63	117.88	19.374	15.701	39.251	169	0.7084	
P5K5 (9)	Rose Creek pluton, East Range (Nevada)	40.85	117.89	19.381	15.687	39.033	93	0.7061	
82DJ-14	Illinois, Tonapah	38.98	117.91	19.040	15.619	38.617	K	0.7045	8.2
P5K1 (9)	Rose Creek pluton, East Range (Nevada)	40.85	117.89	19.433	15.657	38.944	93	0.7061	
NS13-9	New York Can., N.Stillwater Range (NV)	40.05	118.01	19.028	15.649	38.756	71	0.7056	8.9
S94-6	granodiorite pluton, Eugene Mtns. (NV)	40.78	118.13	18.877	15.641	38.640	92	0.7050	
GR-87** (1)	granodiorite, Diaster Peak area (Nevada)	41.93	118.20	18.739	15.585	38.411	91	0.7039	7.7
GR-43** (1)	ixL Canyon, Stillwater Range (Nevada)	39.67	118.22	19.045	15.630	38.701	28	0.7049	11.6
GR-53** (1)	Garfield Hills pluton, (Nevada)	38.40	118.23	20.020	15.779	38.999	111	0.7657	12.1

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic Data (cont.)									
Sample Number (x)=reference	Name (State)	Declat	Declong	^{206}Pb	^{207}Pb	^{208}Pb	Age (Ma)	Initial $^{87}\text{Sr}/^{86}\text{Sr}$	$\delta^{18}\text{O}$ 0/00
87DJ-146	Slate Mountain (Nevada)	39.13	118.24	18.900	15.625	38.576	82	0.7045	
S93-6	Rocky Can. pluton, Humboldt Range (NV)	40.41	118.24	19.086	15.660	38.805	84	0.7051	
Rocky South (9)	Rocky Can. pluton, Humboldt Range (NV)	40.38	118.24	19.130	15.671	38.867	84	0.7051	
Rocky North (9)	Rocky Can. pluton, Humboldt Range (NV)	40.38	118.24	19.099	15.662	38.826	84	0.7051	
GR-89** (1)	Rye Patch Reservoir (Nevada)	40.70	118.25	18.968	15.635	38.514	103	0.7051	10.2
Imlay (9)	S. end Eugene Mountains (Nevada)	40.70	118.25	18.944	15.643	38.663	100	0.7052	
S95-6	S. end Eugene Mountains (Nevada)	40.70	118.25	18.905	15.640	38.649	100	0.7051	
87DJ-157	Eagleville pluton (Nevada)	39.01	118.26	18.964	15.645	38.479	98	0.7043	
87DJ-153	N. Scheelite pluton (Nevada)	39.03	118.33	18.900	15.622	38.612	85	0.7048	
GR-41** (1)	Sand Springs Range (Nevada)	39.13	118.35	18.986	15.628	38.600	83	0.7044	8.7
S96-6	W. of Rye Patch Reservoir (Nevada)	40.58	118.41	18.847	15.654	38.709	80	0.7057	
Trinity 3 (9)	N. Trinity Range pluton (Nevada)	40.48	118.37	18.949	15.643	38.702	100	0.7053	
Trinity 1 (9)	Trinity Range pluton (Nevada)	40.40	118.51	18.850	15.620	38.555	94	0.7046	
Trinity 2 (9)	Trinity Range pluton (Nevada)	40.38	118.45	19.003	15.635	38.634	94	0.7046	
S102-6	Lone Mtn. pluton, Trinity Range (Nevada)	40.18	118.54	18.886	15.622	38.584	107	0.7044	
Lone (9)	Lone Mtn. pluton, Trinity Range (Nevada)	40.19	118.55	18.826	15.629	38.581	107	0.7044	
S98-6	N. end of Trinity Range (Nevada)	40.45	118.55	18.885	15.649	38.664	100	0.7048	
GR-99** (1)	Eagle, Trinity Range (Nevada)	40.28	118.62	19.129	15.621	38.532	100	0.7051	11.1
GR-100** (1)	Eagle, Trinity Range (Nevada)	40.28	118.63	19.013	15.625	38.530	100	0.7051	
Eagle (9)	Trinity Range (Nevada)	40.29	118.63	18.898	15.642	38.676	100	0.7053	
S107-6	Eagle, Trinity Range (Nevada)	40.29	118.64	18.862	15.634	38.630	100	0.7052	
GR-121** (1)	Pine Forest Range (Nevada)	41.70	118.70	18.832	15.604	38.437	90	0.7040	9.6
S113-6	S. Trinity Range (Nevada)	40.01	118.70	18.853	15.634	38.620	95	0.7047	
GR-55** (1)	Wassuk Range pluton (Nevada)	38.45	118.75	19.087	15.637	38.662	77	0.7045	7.8
S97A-6	Stonehouse Can., 7 Troughs Range (NV)	40.52	118.76	18.907	15.626	38.584	100	0.7050	
S111-6	Trinity Range (Nevada)	40.17	118.77	18.832	15.620	38.558	100?	0.7047	
7 Troughs (1)	7 Troughs Range (Nevada)	40.55	118.81	18.847	15.623	38.560	96	0.7049	
S131-7	Pahsupp Mtn. area (Nevada)	40.61	119.00	19.041	15.665	38.774	87	0.7045	
S109-6	N. Shawave Mountains (Nevada)	40.31	119.02	18.819	15.626	38.528	95	0.7045	
S110-6	Lovelock, Shawave Mtns (Nevada)	40.13	119.07	18.860	15.630	38.601	85	0.7047	
S100-6	Trinity Range (Nevada)	40.38	118.48	18.841	15.626	38.569	100	0.7046	
S30-9	Masonic pluton (Nevada)	38.37	119.12	18.995	15.651	38.764	84	0.7060	
87DJ-130	Nightingale dist., Truckee Range (Nevada)	40.00	119.23	18.802	15.599	38.458	98	0.7043	
87DJ-142	Nightingale dist., Truckee Range (Nevada)	39.90	119.25	18.867	15.612	38.585	99	0.7042	
GR-65** (1)	Selenite Range (Nevada)	40.43	119.27	18.814	15.596	38.346	90	0.7043	7.8

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic data (cont.)	Sample Number (x)=reference	Location Name	Declat Declong					Age (Ma)	Initial $^{87}\text{Sr}/^{86}\text{Sr}$	$\delta^{18}\text{O}$ 0/00
			^{206}Pb	^{207}Pb	^{208}Pb					
	S113-2	Swauger Creek pluton (Calif.)	38.34	119.32	18.908	15.617	38.568	95	0.7047	
	S82-2	Log Cabin Creek pluton (Calif.)	38.22	119.32	18.923	15.636	38.624	161	0.7044	
	S86-4	Eagle Creek pluton (Calif.)	38.21	119.36	18.970	15.658	38.699	96	0.7049	
	S24-3	S.Taylor Valley pluton (Calif.)	38.56	119.37	18.866	15.616	38.582	88	0.7057	
	GR-76** (1)	Granite Range pluton (Nevada)	40.67	119.37	18.893	15.607	38.408	98	0.7044	
	GR-75** (1)	Granite Range pluton (Nevada)	40.68	119.38	18.853	15.601	38.430	98	0.7044	8.5
	S20-9	Devils Gate pluton (Calif.)	38.35	119.38	18.934	15.634	38.632	85	0.7050	7.5
	89DJ-100	Fulstone volcanic porphyry (Nevada)	39.06	119.42	19.000	15.625	38.925	167	0.7049	
	S64-2	main Desert Creek pluton (Calif.)	38.58	119.42	19.047	15.643	38.783	155	0.7046	
	S49-3	Desert Creek Diorite (Calif.)	38.59	119.42	18.844	15.614	38.612	155	0.7042	
	S36-3	Desert Creek Porphyry (Calif.)	38.54	119.43	19.665	15.672	39.189	155	0.7056	
	S23-9	Rock Creek pluton (Calif.)	38.49	119.45	18.954	15.645	38.703	83	0.7053	
	S77-2	Sonora Bridge pluton (Calif.)	38.37	119.48	19.082	15.647	38.768	96	0.7045	
	S71-2	Mill Creek pluton (Calif.)	38.39	119.49	18.935	15.662	38.758	84	0.7058	
	S111-2	China Garden pluton (Calif.)	38.53	119.49	19.037	15.638	38.707	91	0.7047	
	87DJ-174	SE Virginia Range (pluton)	39.33	119.49	18.785	15.611	38.532	90	0.7045	
	S5-3	Slinkard Valley pluton (Calif.)	38.64	119.54	18.917	15.647	38.696	84	0.7055	
	S35-8	Sonora Pass, Lertora Lake pluton (Calif.)	38.24	119.54	19.041	15.659	38.741	97	0.7058	
	89DJ-102	Sunrise Pass pluton (Nevada)	39.09	119.54	18.739	15.610	38.454	172	0.7040	
	89DJ-64	Yerington pluton (Nevada)	39.05	119.55	18.846	15.631	38.622	169	0.7040	
	S70-2	White Mountain pluton (Calif.)	38.35	119.58	19.045	15.683	38.806	97	0.7063	
	89DJ-84	Mt. Siegel pluton (Nevada)	38.98	119.58	18.930	15.611	38.517	166	0.7038	
	S10-5	Upper Twin Lake pluton (Calif.)	38.15	119.64	19.326	15.723	39.008	104	0.7069	
	S8-5	Avonelle Lake pluton (Calif.)	38.12	119.66	19.195	15.676	38.850	100	0.7064	
	S38-7	Sonora Pass, Maxwell Lake pluton (Calif.)	38.17	119.66	19.062	15.698	38.885	98	0.7057	
	89DJ-69	Mount Siegel pluton (Nevada)	39.06	119.66	18.988	15.627	38.682	166	0.7044	
	89DJ-70	Mount Siegel pluton (Nevada)	39.06	119.66	18.927	15.623	38.578	166	0.7044	
	GR-63** (1)	Pah Rah Range pluton (Nevada)	39.80	119.67	18.691	15.597	38.377	90	0.7039	6.8
	S13-5	Lower Twin Lake pluton (Calif.)	38.14	119.68	19.258	15.715	38.956	98	0.7059	
	GR-64** (1)	Pah Rah Range pluton (Nevada)	39.80	119.68	18.749	15.595	38.356	90	0.7040	
	89DJ-74	Prison Hill pluton (Nevada)	39.11	119.68	18.801	15.607	38.486	100	0.7047	
	S15-5	Lower Twin Lake pluton (Calif.)	38.13	119.69	19.268	15.718	38.981	98	0.7063	
	S16-5	Lower Twin Lake pluton (Calif.)	38.13	119.70	19.257	15.721	39.008	98	0.7068	
	S25-5	Lower Twin Lake pluton (Calif.)	38.13	119.70	19.193	15.679	38.873	98	0.7069	
	S17-5	Boundary Lake, Lake Vernon pluton (Calif.)	38.11	119.71	19.207	15.695	38.905	91	0.7068	

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic Data (cont.)									
Sample Number (x)=reference	Name (State)	Declat	Declong	^{206}Pb ^{204}Pb	^{207}Pb ^{204}Pb	^{208}Pb ^{204}Pb	Age (Ma)	Initial $^{87}\text{Sr}/^{86}\text{Sr}$	$\delta^{18}\text{O}$ 0/00
S26-5	Boundary Lake, Lower Twin Lake (Calif.)	38.12	119.71	19.312	15.718	39.018	97	0.7066	
S18-5	Mahan Peak pluton (Calif.)	38.10	119.72	19.171	15.697	38.907	94	0.7069	
S24-8	Sonora Pass, Lettora Lake pluton (Calif.)	38.14	119.72	19.030	15.654	38.730	97	0.7058	
S59-4	Topaz Lake pluton, Kennedy Mead. (Calif.)	38.32	119.75	18.918	15.639	38.676	87	0.7055	
S1-4	Boundary Lake pluton (Calif.)	38.15	119.77	19.217	15.697	38.911	91	0.7067	
S11-4	Wire Lakes pluton (Calif.)	38.16	119.78	19.053	15.677	38.802	97	0.7056	
S28-4	Whitesides Meadow pluton (Calif.)	38.17	119.79	19.177	15.698	38.902	115	0.7057	
S36-4	Outer Boundary Lake pluton (Calif.)	38.13	119.80	19.227	15.713	38.967	91	0.7067	
87DJ-185	Dogskin Mountain pluton (Nevada)	39.81	119.81	18.798	15.632	38.532	90	0.7044	
82-DJ-316	Kinney Lakes pluton (Calif.)	38.24	119.83	19.036	15.674	38.800	91	0.7058	
S86-3	Stanislaus Meadow pluton (Calif.)	38.54	119.87	19.112	15.697	38.970	110	0.7062	
S16-2	Lookout Peak pluton (Calif.)	38.50	119.89	19.057	15.646	38.798	110	0.7064	
S14-2	Ebbetts Pass pluton (Calif.)	38.54	119.90	19.061	15.666	38.811	95	0.7060	
S87-3	Stanislaus Meadow pluton (Calif.)	38.52	119.90	19.033	15.682	38.879	110	0.7056	
S77-4	Kinney Lakes pluton (Calif.)	38.35	119.91	19.036	15.680	38.820	91	0.7057	
S25-0	Stanislaus Meadow pluton (Calif.)	38.51	119.92	19.029	15.670	38.837	110	0.7058	8.4
S11-7	Sonora Pass, Bull Run Lake pluton (Calif.)	38.49	119.94	19.092	15.685	38.959	127	0.7069	
S31-5	Bummers Flat pluton (Calif.)	38.31	119.94	19.135	15.657	38.778	102	0.7063	
S138-7	McFaul Creek pluton (Nevada)	39.00	119.95	18.921	15.632	38.644	92	0.7056	
S49-2	Cascade Creek pluton (Calif.)	38.28	119.97	19.191	15.695	38.903	97	0.7066	
S18-2	Outer Niagara Creek pluton (Calif.)	38.48	119.99	19.128	15.684	38.854	91	0.7062	
S64-3	Outer Niagara Creek pluton (Calif.)	38.40	120.03	19.133	15.679	38.842	91	0.7062	
S67-3	Inner Niagara Creek pluton (Calif.)	38.41	120.04	19.084	15.677	38.822	91	0.7059	
S23-0	Big Meadow pluton (Calif.)	38.41	120.12	19.166	15.688	38.923	116	0.7070	7.5
S150-7	W. of Meeks Bay (Calif.)	39.05	120.18	19.036	15.661	38.865	112	0.7073	
S155-7	Cold Creek, Highway 40 (Calif.)	39.32	120.29	18.847	15.645	38.641	102	0.7050	
S154-7	Lake Tahoe area, Summit Lake (Calif.)	39.36	120.31	18.823	15.614	38.537	101	0.7048	
S162-7	Granite Chief pluton (Calif.)	39.19	120.32	18.828	15.632	38.595	101	0.7046	
S143-7	Loon Lake area (Calif.)	38.97	120.33	19.150	15.683	39.071	105	0.7098	
S144-7	Loon Lake area (Calif.)	38.99	120.33	19.139	15.687	39.190	105	0.7090	
S144A-7	Loon Lake area (Calif.)	38.99	120.33	19.107	15.693	39.133	105	0.7089	
S142-7	Loon Lake area (Calif.)	38.97	120.33	19.148	15.672	39.060	105	0.7114	
S141-7	Loon Lake area (Calif.)	38.97	120.33	19.198	15.675	39.067	105	0.7149	
S161-7	Forest Hill Divide, NW Lyon Peak (Calif.)	39.22	120.33	18.896	15.644	38.691	101	0.7053	
S139-7	Loon Lake area, Gabbro (Calif.)	38.97	120.33	19.075	15.692	39.018	105	0.7057	

Table 1. Northern Great Basin, Sierra Nevada Pb, Sr and Oxygen Isotopic Data (cont.)									
Sample Number	Name (State)	Declat	Declong	^{206}Pb	^{207}Pb	^{208}Pb	Age (Ma)	Initial $^{87}\text{Sr}/^{86}\text{Sr}$	$\delta^{18}\text{O}$ 0/00
(x)=reference				^{204}Pb	^{204}Pb	^{204}Pb			
S139A-7	Loon Lake area (Calif.)	38.97	120.33	19.034	15.657	38.932	105	0.7058	
S158-7	White Rock Lake pluton (Calif.)	39.34	120.33	18.946	15.645	38.754	119	0.7057	
S163-7	The Cedars pluton (Calif.)	39.25	120.35	18.959	15.679	38.846	102	0.7059	
S160-7	Serena Creek diorite (Calif.)	39.28	120.38	19.010	15.643	38.750	136	0.7050	
S183-7	White Rock Lake pluton (Calif.)	39.42	120.39	19.009	15.641	38.794	119	0.7057	
S169-7	Lily Pond pluton (Calif.)	39.37	120.42	18.878	15.620	38.614	100	0.7052	
S182-7	French Lake pluton (Calif.)	39.42	120.54	18.930	15.657	38.779	163	0.7059	
SCC-19	Omo Ranch pluton (Calif.)	38.58	120.55	18.969	15.621	38.671	152	0.7050	
S179-7	Downey Lake pluton (Calif.)	39.40	120.59	18.815	15.651	38.683	163	0.7048	
S178-7	Grouse Ridge pluton (Calif.)	39.39	120.61	18.773	15.562	38.445	163	0.7047	
SCC-1	Pino Grande pluton (Calif.)	38.91	120.61	18.907	15.636	38.796	170	0.7086	
SCg-1	N.Y. Ranch pluton (Calif.)	38.39	120.65	18.800	15.601	38.544	125	0.7041	
S59-0	Pino Grande pluton (Calif.)	38.90	120.67	18.881	15.637	38.768	170	0.7072	9.3
Z-10 (10)	Cathedral Peak Granodiorite (Calif.)	37.88	119.41	18.804	15.641	38.685	86	0.7064	8.3
Z-14 (10)	Inner Half Dome Granodiorite (Calif.)	37.88	119.33	18.797	15.629	38.649	86	0.7063	
Z-54 (10)	Outer Half Dome Granodiorite (Calif.)	37.86	119.48	19.019	15.668	38.790	92	0.7058	7.7
FD-13 (10)	Quartz diorite of Glacier Point (Calif.)	37.72	119.57	18.995	15.651	38.729	92	0.7057	6.4
COBA-6-2	Tonalite, Cordell Bank (offshore Calif.)	37.76	123.13	18.896	15.645	38.646	99	0.7055	
MC-113F (11)	Post Peak pluton (Calif.)	37.62	119.38	19.109	15.673	38.846	86	0.7063	
MC-122F (11)	Jackass pluton (Calif.)	37.66	119.29	19.086	15.673	38.838	98	0.7063	
MC-274F (11)	Red Peak pluton (Calif.)	37.63	119.42	19.366	15.710	39.006	97	0.7075	
MC-276F (11)	Timber Knob pluton (Calif.)	37.58	119.31	19.049	15.657	38.788	97	0.7062	
MC-278F (11)	metavolc. rock Merced Peak quad (Calif.)	37.61	119.38	19.135	15.671	38.841	100	0.7063	
MC-280F (11)	Norris Creek pluton (Calif.)	37.77	119.19	19.064	15.651	38.821	94	0.7055	
MC-281F (11)	pre-ignimbrite (Calif.)	37.75	119.18	19.000	15.632	38.762	100	0.7051	
MC-298F (11)	post-ignimbrite (Calif.)	37.67	119.18	18.959	15.623	38.720	100	0.7051	
MC-299F (11)	Shellenberger pluton (Calif.)	37.62	119.17	18.897	15.616	38.672	100	0.7048	
#14 Groundmass	Santa Rita Flat Pluton (Calif.)	38.90	118.19	18.718	15.656	38.896	164	0.7071	
#17 megacryst	Santa Rita Flat Pluton (Calif.)	38.90	118.19	18.666	15.641	38.811	164	0.7071	
#80 whole-rock	Santa Rita Flat Pluton (Calif.)	38.90	118.19	18.690	15.639	38.803	164	0.7071	

Table 2. Northern Great Basin Pb Isotopic data							
Sample Number (x)=reference	Name	Declat	Declong	²⁰⁶ Pb ²⁰⁴ Pb	²⁰⁷ Pb ²⁰⁴ Pb	²⁰⁸ Pb ²⁰⁴ Pb	Age (Ma)
H96-59 (1)	Tuscarora rhyolite dome, Dry Creek Mtns.	41.38	116.32	17.092	15.598	39.848	39
NEI-8	Tuscarora Mountains, monzodiorite	40.62	116.26	19.744	15.729	39.415	K or T
NEI-9	Tuscarora Mountains, monzodiorite	40.60	116.27	19.548	15.713	39.269	K or T
DB-19-WM (14)	Tuscarora, rhyolite dome, Dry Creek Mtns.	41.32	116.39	17.833	15.604	39.268	39
NEP-19	Cortez Mountains, monzodiorite	40.28	116.33	19.572	15.698	39.170	154
96DJ-65 (15)	rhyolite porphyry, Sheep Creek Range	40.86	116.61	19.026	15.691	39.141	15
96DJ-62 (15)	porphyritic dacite, Sheep Creek Range	40.73	116.76	19.253	15.668	39.106	15.3
H96-80 (14)	Tuscarora- rhyolite tuff, Dry Creek Mtns.	41.41	116.34	18.872	15.663	39.103	39
H96-72 (14)	Tuscarora - grano., Dry Creek Mtns.	41.32	116.36	18.885	15.673	39.103	39
NEP-20	granite, Simpson Park Mtns.	39.70	116.77	19.477	15.708	39.085	168
H96-104 (14)	Tuscarora - adularia, Dry Creek Mtns.	41.32	116.24	19.067	15.676	39.080	39
H96-19 (14)	Tuscarora - rhy. dike, Dry Creek Mtns.	41.37	116.25	18.835	15.661	39.034	39
96DJ-81 (15)	Izzenhood Spring, rhyolite porphyry	40.95	116.86	19.133	15.663	39.024	14.8
Type II	Round Mountain, adularia	38.70	117.08	19.459	15.667	39.013	25
H96-98 (14)	Tuscarora - adularia, Dry Creek Mtns.	41.31	116.23	19.054	15.670	38.987	39
BS95-U.4	granodiorite, Wilson District	38.75	118.87	19.260	15.657	38.952	K ?
92DJ-92 (16)	IXL pluton, S. Stillwater Range	39.66	118.19	19.118	15.690	38.925	28
H95-116	Toquima Range. rhyolite dome	38.71	116.83	19.170	15.660	38.873	25
H95-63	Virgin Valley - rhyolite lava	41.79	118.93	19.055	15.643	38.868	T
Stebbins Hill	Round Mountain, adularia	38.71	117.08	19.179	15.649	38.859	25
Enright Hill				19.200	15.668	38.858	J
H95-120	Toquima Range, rhyolite dome	38.92	116.96	19.175	15.649	38.846	25
H94-31	Toquima Range, rhyolite dome	38.67	116.89	19.165	15.649	38.844	25
H94-33	Toquima Range, rhyolite dome	38.76	117.04	19.158	15.650	38.839	25
Northumberld	granodiorite, N. Toquima Range	38.96	116.87	19.215	15.673	38.817	157
H95-71	Virgin Valley - rhyolite lava	41.87	118.99	19.180	15.629	38.756	T
CC-141	Rytuba, rhyolite, McDermitt, Caldera	41.82	118.18	19.122	15.648	38.744	16-14
H93-114	Fairview Peak rhyolite dome	39.21	118.00	19.026	15.638	38.731	31-20
CC-137	Rytuba, rhyolite, McDermitt Caldera	41.60	118.08	19.091	15.649	38.722	16-14
CC-135A	Rytuba, rhyodacite, McDermitt	42.08	118.15	19.087	15.630	38.715	16-14
H93-108	Fairview Peak rhyolite tuff	39.14	118.09	18.999	15.629	38.708	31-20
D-68	Rytuba,Ta, McDermitt Caldera	42.13	117.90	18.963	15.607	38.706	16-14

Sample Number	Name	Declat	Declong	^{206}Pb ^{204}Pb	^{207}Pb ^{204}Pb	^{208}Pb ^{204}Pb	Age (Ma)
CC-138A	Rytuba, rhyolite, McDermitt Caldera	41.62	118.15	19.072	15.644	38.695	16-14
H93-52	Fairview Peak rhyolite dike	39.14	118.19	19.010	15.623	38.681	31-20
JR80-16	Rytuba, Tpa, McDermitt Caldera	42.15	117.97	19.073	15.624	38.674	16-14
94NCA-20-2	aplite in granodiorite, N. Selenite Range	40.70	119.24	18.956	15.643	38.662	90
CC-123	Rytuba, rhyolite, McDermitt Caldera	41.78	118.15	19.078	15.642	38.640	16-14
CC-131	Rytuba, rhyolite, McDermitt Caldera	41.73	118.15	19.100	15.632	38.635	16-14
H95-57	Virgin Valley - rhyolite lava	41.52	119.13	19.026	15.611	38.631	T
94NCA-14	granodiorite, Trego Hot Springs	40.77	119.09	18.858	15.640	38.604	90
94NCA-19	granodiorite, N. Selenite Range	40.75	119.15	18.848	15.641	38.601	90
JR79-85	Rytuba, Taz, McDermitt Caldera	42.00	118.22	18.991	15.608	38.596	16-14
OC-13	Rytuba, McDermitt Caldera	42.02	118.38	18.966	15.612	38.590	16-14
94NCA-13	granodiorite, Black Rock Range	41.27	119.12	18.883	15.631	38.585	J or K
94NCA-20-1	granodiorite, N. Selenite Range	40.70	119.24	18.852	15.627	38.564	90
BS95-U.1	granodiorite, Wilson District	38.75	119.00	18.740	15.612	38.448	K ?
94NCA-5	granodiorite, Division Peak	41.10	119.28	18.836	15.607	38.448	K ?
BS95-U.2	granodiorite, Wilson District	38.75	119.00	18.728	15.615	38.445	K