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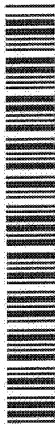
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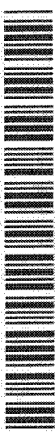
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A LIST OF AGE DETERMINATIONS OF CENOZOIC IGNEOUS ROCKS OF UTAH

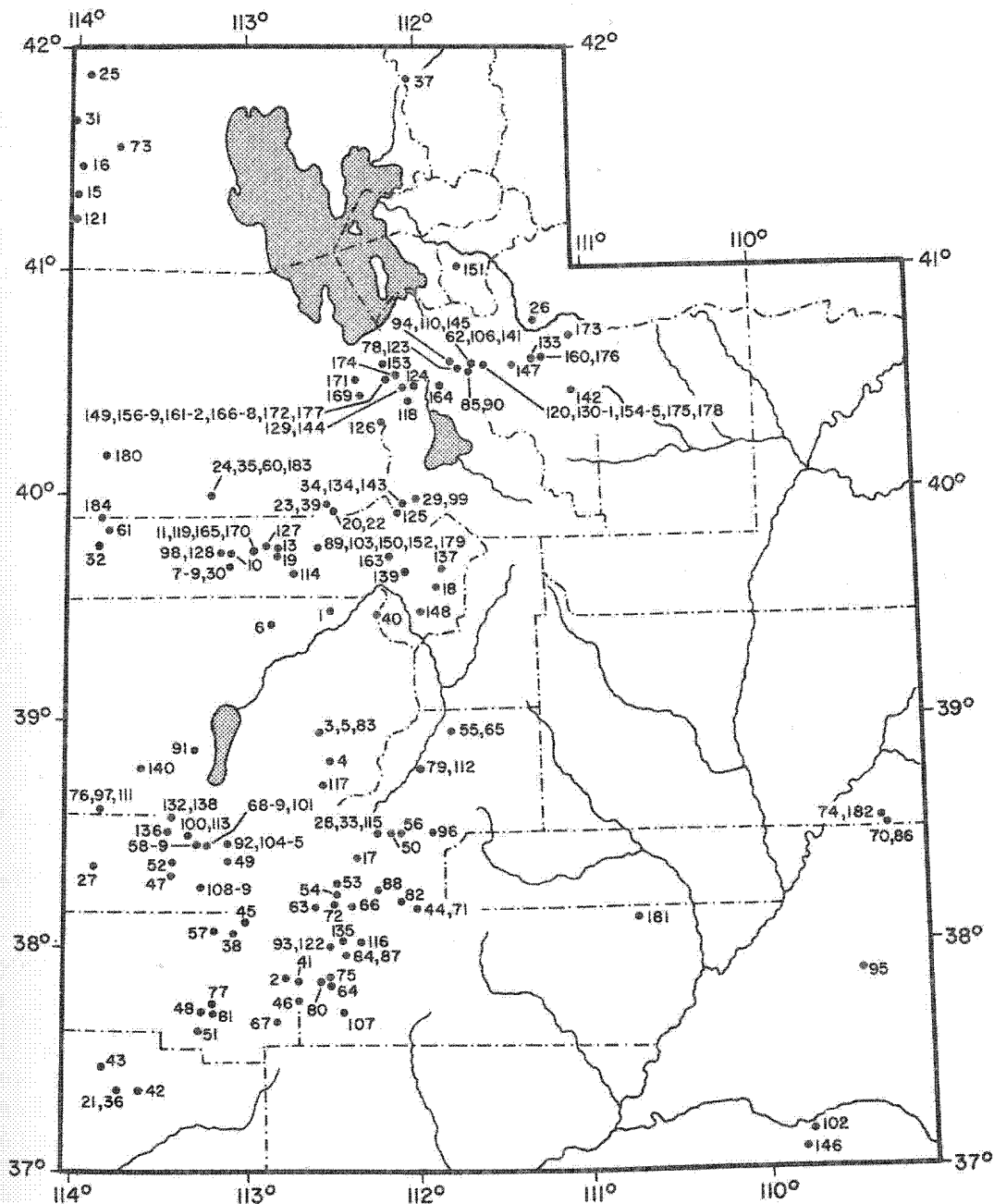
by J. B. Noble, *Department of Geology, Stanford Univ.*,
 W. S. Snyder, and M. L. Rapoport, *Department of Applied Earth Sciences, Stanford Univ., Stanford, CA 94305*

This report presents a list of the available radiometric age dates of igneous rocks of Utah for the time interval 80 m.y. to the present. These data were used by Snyder, Dickinson, and Silberman in their paper, "Tectonic Implications of Space-Time Patterns of Cenozoic Magmatism in the Western United States" (*Earth and Planetary Science Letters*, 1976, v. 32, p. 91-106).

The list is arranged by age from the present to 80 m.y. The range of error is shown in the column "+/-". Latitude and longitude follow. Rock types are listed in the next

column. These rock type names are general descriptions and should be loosely interpreted. The type of analysis is given under the heading "Method" and this is followed by a column that lists the mineral analyzed. The reference for each date is cited in the final column. The second part of this report consists of a more detailed bibliography of each of these references.

This list of age dates was compiled up through mid-1975 from available published sources. It should be noted that the dates presented here represent a selected set of data.



Discordant dates were not used, although a few borderline cases are reported. Concordant dates based on the same mineral were averaged and are indicated by an asterisk (*) following the date. Concordant dates based on two or more different minerals were also averaged for use in the summary by Snyder and others (1976), but here the dates for each mineral are reported separately. Interested readers should consult the individual references for more complete information about specific dates.

A list of abbreviations used in the table follows:

ap	— apatite	LA	— lead-alpha
bio	— biotite	mus	— muscovite
feld	— feldspar	plag	— plagioclase
FT	— fission track	pyx	— pyroxene
gl	— glass	san	— sanidine
hbl	— hornblende	sp	— sphene
KA	— potassium-argon	WR	— whole rock
kf	— potassium-feldspar	zir	— zircon

Map no.	Age	+/-	Latitude	Longitude	Rock type	Method	Mineral	Reference
1	0.003 0.128	min max	39.50N	112.50W	basalt	KA	WR	Hoover (1974)
2	0.4		37.87N	112.77W	basalt	KA	WR	Fleck & others (1975)
3	0.536*		38.97N	112.60W	basalt	KA	WR	Hoover (1974)
4	0.667*		38.80N	112.48W	basalt	KA	WR	Hoover (1974)
5	0.918*		38.87N	112.58W	basalt	KA	WR	Hoover (1974)
6	3.4	0.2	39.44N	112.85W	rhyolite	KA	san	Armstrong (1970)
7	6.0	0.2	39.69N	113.11W	rhyolite	KA	san	Armstrong (1970)
8	6.1	0.3	39.70N	113.08W	alkali rhyolite	FT	zir	Lindsey & others (1975)
9	6.2	0.4	39.68N	113.08W	alkali rhyolite	FT	zir	Lindsey & others (1975)
10	6.6	0.3	39.75N	113.08W	alkali rhyolite	FT	zir	Lindsey & others (1975)
11	7.8	0.6	39.77N	112.94W	alkali rhyolite	FT	sp	Lindsey & others (1975)
12†	7.9	0.5	42.00N	115.42W	basalt	KA	WR	Mark & others (1975)
13	8.2	0.5	39.77N	112.81W	alkali rhyolite	FT	zir	Lindsey & others (1975)
14†	8.2	0.6	41.95N	114.60W	basalt	KA	WR	Mark & others (1975)
15	8.4	0.2	41.34N	114.03W	quartz latite	KA	san	Armstrong (1970)
16	8.4*	0.2	41.48N	113.98W	rhyolite	KA	feld	Armstrong & others (1976)
17	9.2	0.3	38.39N	112.36W	granite	KA	bio	Armstrong (1970)
18	10.0		39.59N	111.89W	tuff, pumice, ash flow	KA		Evernden & James (1964)
19	10.0	0.9	39.75N	112.81W	rhyolite	FT	zir	Lindsey & others (1975)
20	12.0		39.94N	112.50W	rhyolite	LA	zir	Whelan (1970)
21	12.3	0.3	37.37N	113.75W	tuff, pumice, ash flow	KA	san	Noble & McKee (1972)
22	13.0		39.94N	112.50W	granite	LA	zir	Whelan (1970)
23	13.0		39.95N	112.53W	granite	KA		Odekirk (1963)
24	13.0	5	40.00N	113.21W	tuff, pumice, ash flow	KA	kf	Edwards & McLaughlin (1972)
25	13.1*	0.3	41.88N	113.92W	rhyolite	KA	feld	Armstrong & others (1976)
26	13.3		40.78N	111.29W	trachyte	KA	mus	Best & others (1968)
27	15.5	1.5	38.37N	113.88W	skarn	KA	bio & mus	Whelan (1970)
28	15.6*		38.50N	112.23W	obsidian	KA	WR	Bassett & others (1963)
29	15.6 18.3	2.6 0.5	39.98N	112.01W	latite	KA	san	Damon (1968)
30	16.2	1.5	39.70N	113.10W	rhyolite	KA	san	Whelan (1970)
31	16.3	2.0	41.65N	114.10W	basalt	KA	WR	Armstrong & others (1976)
32	17.7	0.9	39.78N	113.87W	granite	KA	mus	Whelan (1970)
33	17.8		38.49N	112.23W	obsidian	KA	WR	Bassett & others (1963)
34	17.9	0.5	39.96N	112.07W	latite	KA	bio	Damon (1968)
35	18.0	1	40.00N	113.21W	trachyte	KA	kf	Edwards & McLaughlin (1972)
36	18.2	0.5	37.37N	113.75W	tuff, pumice, ash flow	KA	bio	Noble & McKee (1972)
37	18.9	1.6	41.86N	112.06W	tuff, pumice, ash flow	KA		Williams (1964)
38	19.0	0.6	38.07N	113.07W	intermediate volcanic	KA	WR	Fleck & others (1975)
39	19.0	3	39.94N	112.53W	adamellite	KA	bio	Armstrong (1966)
40	19.7*		39.48N	112.26W	obsidian	KA	WR	Bassett & others (1963)
41	19.7	0.5	37.85N	112.70W	diabasic gabbro	KA	WR	Fleck & others (1975)
42	19.9	0.5	37.37N	113.63W	tuff, pumice, ash flow	KA	bio	Noble & McKee (1972)
43	20.3	0.5	37.47N	113.83W	tuff, pumice, ash flow	KA	bio	Noble & McKee (1972)
44	20.3	0.5	38.17N	112.03W	tuff, pumice, ash flow	KA	san	Damon (1968)

Site no.	Age	+/-	Latitude	Longitude	Rock type	Method	Mineral	Reference
65	20.6	0.4	38.11N	113.00W	intermediate volcanic	KA	WR	Fleck & others (1975)
66	20.7	0.5	37.76N	112.68W	andesite	KA	WR	Fleck & others (1975)
67	20.8	0.9	38.32N	113.44W	rhyodacite	KA	plag bio	Lemmon & others (1973)
68	22.4	0.9						
69	20.9	0.4	37.71N	113.25W	granodiorite	KA	bio	Armstrong (1970)
70	20.9	0.6	38.40N	113.12W	adamellite	KA	bio	Marvin (1968)
71	21.0*		38.53N	112.19W	plutonic	KA	bio	Bassett & others (1963)
72	21.3	0.5	37.64N	113.29W	tuff, pumice, ash flow	KA	gl bio	Armstrong (1970)
73	23.3	0.5					plag	
74	24.7	0.7						
75	21.6	0.9	38.37N	113.44W	dacite	KA	kf	Lemmon & others (1973)
76	21.8	0.4	38.28N	112.47W	rhyodacite	KA	bio	Fleck & others (1975)
77	21.8	0.4	38.23N	112.48W	basalt	KA	WR	Fleck & others (1975)
78	21.8	0.4	38.96N	111.80W	rhyodacite	KA	bio	Fleck & others (1975)
79	21.8	0.7	38.51N	112.11W	adamellite	KA	bio	McDowell (1971)
80	21.9	0.4	38.08N	113.18W	intermediate volcanic	KA	bio	Fleck & others (1975)
81	21.9	0.7	38.45N	113.27W	tuff, pumice, ash flow	KA	kf	Marvin (1968)
82	21.9	0.9	38.45N	113.26W	latite tuff	KA	san	Lemmon & others (1973)
83	22.0	1	40.00N	113.21W	granite	KA	kf	Edwards & McLaughlin (1972)
84	22.0	3	39.85N	113.81W	adamellite	KA	bio	Armstrong (1966)
85	22.0	3	40.58N	111.66W	granodiorite	KA	bio	Armstrong (1966)
86	22.1	0.4	38.19N	112.60W	tuff	KA	bio	Fleck & others (1975)
87	22.1	0.6	37.83N	112.52W	rhyolite tuff	KA	plag	Fleck & others (1975)
88	22.3	0.4	38.96N	111.80W	tuff	KA	bio	Fleck & others (1975)
89	22.3	0.4	38.20N	112.39W	basalt	KA	WR	Fleck & others (1975)
90	22.3	0.5	37.68N	112.83W	tuff, pumice, ash flow	KA	san bio	Armstrong (1970)
91	24.0	0.5						
92	22.4	0.7	38.45N	113.23W	tuff, pumice, ash flow	KA	bio	Marvin (1968)
93	22.4	0.9	38.45N	113.24W	latite tuff	KA	bio	Lemmon & others (1973)
94	22.5	3.3	38.53N	109.27W	monzonite	KA	pyx	Stern & others (1965)
95	22.8	0.4	38.15N	112.03W	tuff	KA	bio	Fleck & others (1975)
96	22.9	0.4	38.19N	112.50W	andesite dike	KA	WR	Fleck & others (1975)
97	23.3	0.5	41.56N	113.74W	adamellite	KA	bio	Armstrong (1970)
98	23.5	0.5	38.57N	109.29W	diorite	KA	pyx-hbl	Armstrong (1969)
99	24.0	0.4	37.87N	112.53W	tuff	KA	bio	Fleck & others (1975)
100	24.0	3	38.62N	113.84W	tuff	KA	bio-hbl	Armstrong (1966)
101	24.0	3	37.75N	113.21W	granodiorite	KA	bio	Armstrong (1966)
102	24.1	0.6	40.57N	111.75W	qtz monzonite	FT	sp zir	Crittenden & others (1973)
103	24.5	0.6						
104	25.1	0.8				KA	bio	
105	24.5	0.5	38.79N	111.98W	latite	KA	WR	Armstrong (1970)
106	25.0	0.4	37.85N	112.57W	tuff	KA	plag	Fleck & others (1975)
107	25.0	0.5	37.71N	113.20W	tuff, pumice, ash flow	KA	WR	Armstrong (1970)
108	25.1	0.4	38.20N	112.10W	tuff	KA	bio	Fleck & others (1975)
109	25.1	0.7	38.95N	112.58W	andesite	KA	WR	Fleck & others (1975)
110	25.2	0.4	37.97N	112.43W	tuff	KA	plag	Fleck & others (1975)
111	25.5	0.8	40.56N	111.68W	ore, greisen	KA	mus	Crittenden & others (1973)
112	25.5	2.5	38.53N	109.25W	syenite	KA	pyx	Stern & others (1965)
113	25.8	0.5	37.97N	112.44W	mylonite	KA	bio	Armstrong (1970)
114	26.0	0.8	38.25N	112.26W	andesite	KA	hbl	Fleck & others (1975)
115	26.5	0.5	39.78N	112.59W	granite	KA	bio kf	Armstrong (1970)
116	26.5	0.6						
117	26.7	0.8	40.57N	111.70W	adamellite	KA	bio	McDowell (1971)
118	26.8	0.4	38.88N	113.30W	tuff	KA	bio	Armstrong & others (1976)
119	27.0	1.0	38.46N	113.10W	qtz monzonite	KA	hbl	Lemmon & others (1973)
120	27.2	0.6	38.00N	112.51W	mylonite	KA	bio	Armstrong (1970)
121	27.3		40.58N	111.79W	schist	KA		Hashad (1964)

Map no.	Age	+/-	Latitude	Longitude	Rock type	Method	Mineral	Reference
95	27.4 28.2	0.6 0.6	37.87N	109.45W	diorite	KA	alt. mafic WR	Armstrong (1969)
96	27.5	0.4	38.50N	112.42W	tuff	KA	bio	Caskey & Shuey (1972)
97	27.7 29.2	0.6 0.6	38.62N	113.84W	tuff	KA	gl bio	Armstrong (1970)
98	27.8 29.9 31.9	3.0 0.9	39.76N	113.16W	rhyolite tuff	FT	sp zir ap	Lindsey & others (1972)
99	27.8	0.8	39.98N	112.04W	quartz latite	KA	san	Laughlin & others (1972)
100	28.0	0.8	38.48N	113.32W	granodiorite	KA	bio	Marvin (1968)
101	28.0	1.2	38.48N	113.21W	granodiorite	KA	bio	Lemmon & others (1972)
102	28.0 30.3	3 2.7	37.17N	109.73W	granite	FT	ap	Naaser (1971)
103	28.2 32.4	2.3 1.2	39.78N	112.58W	qtz monzonite	FT	sp zir	Lindsey & others (1972)
104	28.4	0.9	38.48N	113.12W	granodiorite	KA	hbl	Marvin (1968)
105	28.4	1.2	38.48N	113.13W	granodiorite	KA	hbl	Lemmon & others (1972)
106	28.4	1.4	40.58N	111.66W	qtz monzonite	KA	bio	Crittenden & others (1972)
107	28.9	1.2	37.71N	112.43W	dacite tuff	KA	bio	Fleck & others (1972)
108	29.0 29.2	0.9 0.9	38.28N	113.27W	tuff, pumice, ash flow	KA	bio hbl	Marvin (1968)
109	29.2 29.3	1.2 1.2	38.29N	113.28W	dacite tuff	KA	hbl bio	Lemmon & others (1972)
110	29.5		40.58N	111.79W	pegmatite	KA	mus	Whelan (1970)
111	29.6	0.6	38.62N	113.84W	tuff, pumice, ash flow	KA	bio	Armstrong (1970)
112	29.6	0.6	38.79N	111.98W	tuff, pumice, ash flow	KA	bio	Armstrong (1970)
113	29.7	0.6	38.49N	113.31W	adamellite	KA	bio	Armstrong (1970)
114	30.0	2	39.67N	112.71W	pegmatite	KA	mus	Whelan (1970)
115	30.0	3.0	38.53N	112.26W	monzonite	KA	hbl	McDowell (1971)
116	30.4	1.5	38.03N	112.33W	plutonic	KA	hbl	Damon (1969)
117	30.6	0.3	38.72N	112.55W	tuff	KA	bio	Caskey & Shuey (1972)
118	30.7	0.9	40.43N	112.04W	tuff	KA	bio	Moore (1973)
119	30.8	1.8	39.77N	112.92W	qtz latite intrusive	FT	zir	Lindsey & others (1972)
120	30.9 32.6	1.5 1.0	40.58N	111.59W	granite	KA	hbl bio	Crittenden & others (1972)
121	31.0	1.5	41.21N	114.03W	granodiorite	KA	bio	Coats & others (1966)
122	31.1	0.5	38.01N	112.54W	tuff	KA	bio	Fleck & others (1972)
123	31.1	0.9	40.57N	111.75W	qtz monzonite	KA	hbl	Crittenden & others (1972)
124	31.2	0.9	40.42N	112.02W	rhyolite	KA	bio	Moore (1973)
125	31.5	0.9	39.92N	112.12W	monzonite	KA	bio	Laughlin & others (1972)
126	31.6	1.1	40.31N	112.20W	rhyolite	KA	bio	Moore (1973)
127	31.6 32.2 32.5	2.5 1.6 2.5	39.78N	112.88W	rhyolite tuff	FT	sp zir ap	Lindsey & others (1972)
128	31.7 32.5	2.1 1.2	39.73N	113.16W	rhyolite tuff	FT	sp zir	Lindsey & others (1972)
129	32.0	0.9	40.49N	112.08W	rhyolite	KA	bio	Moore & others (1966)
130	32.1 32.8	1.0 0.7	40.58N	111.61W	granite	KA	bio	Crittenden & others (1972)
131	32.1 32.7* 33.5 33.7*	1.0 0.9 1.0 0.9	40.60N	111.58W	granite	KA FT KA FT	bio sp hbl zir	Crittenden & others (1972)
132	32.3	1.2	38.57N	113.43W	andesite	KA	hbl	Lemmon & others (1972)
133	32.7	1.0	40.60N	111.29W	andesite-rhyodacite	KA	bio	Crittenden & others (1972)
134	32.7 32.8	1.0 1.0	39.98N	112.06W	quartz latite	KA	san bio	Laughlin & others (1972)
135	32.8	0.5	38.02N	112.44W	andesite	KA	WR	Fleck & others (1972)
136	33.1	1.5	38.51N	113.47W	rhyodacite	KA	plag	Lemmon & others (1972)
137	33.2		39.66N	111.86W	tuff	KA		Evernden & Jones (1968)

Map no.	Age	+/-	Latitude	Longitude	Rock type	Method	Mineral	Reference
138	33.6	1.5	38.59N	113.43W	dacite	KA	bio	Lemmon & others (1973)
139	33.8	0.7	39.66N	112.07W	tuff, pumice, ash flow	KA	bio	Armstrong (1970)
140	33.9 39.0	0.5 1.0	38.80N	113.60W	tuff	KA	bio hbl	Armstrong & others (1976)
141	34.0		40.58N	111.67W	monzonite	KA		Hashad (1964)
142	34.0	1.0	40.47N	111.06W	andesite-rhyodacite	KA	bio	Crittenden & others (1973)
143	34.1	1.0	39.96N	112.07W	monzonite	KA	bio	Damon (1968)
144	34.1	1.0	40.50N	112.07W	obsidian	KA	bio	Moore & others (1968)
145	34.5		40.58N	111.79W	adamellite	LA	zir	Whelan (1970)
146	35.0	4	37.10N	109.78W	greenschist, blueschist	FT	ap	Naeser (1971)
147	35.1	1.1	40.58N	111.43W	andesite-rhyodacite	KA	bio	Crittenden & others (1973)
148	35.8	0.7	39.48N	111.97W	tuff, pumice, ash flow	KA	bio	Armstrong (1970)
149	35.9	1.6	40.52N	112.16W	latite	KA	bio	Moore & others (1968)
150	36.0		39.79N	112.58W	granite	KA		Odekirk (1963)
151	36.0 37.4 37.5		41.03N	111.75W	tuff	KA	gl san bio	Evernden & others (1964)
152	36.0 41.0		39.78N	112.55W	granite	LA	zir	Whelan (1970)
153	36.5	1.1	40.58N	112.20W	latite	KA	bio	Moore (1973)
154	36.7	1.5	40.60N	111.54W	quartz diorite	KA	bio	Crittenden & others (1973)
155	36.8	1.1	40.61N	111.53W	granodiorite	KA	bio	Crittenden & others (1973)
156	36.9	1.0	40.52N	112.16W	quartz latite	KA	bio	Moore & others (1968)
157	36.9	1.0	40.52N	112.13W	quartz latite	KA	bio	Moore & others (1968)
158	36.9	1.1	40.52N	112.16W	latite	KA	bio	McDowell (1971)
159	36.9	1.1	40.52N	112.15W	quartz latite	KA	bio	McDowell (1971)
160	37.0		40.62N	111.26W	potassic rock	KA	mus	Best & others (1968)
161	37.1	1.1	40.49N	112.21W	quartz latite	KA	bio	Moore (1973)
162	37.2 37.5	1.2 1.2	40.52N	112.16W	syenite	KA	bio mus	Moore & others (1968)
163	37.2 39.7	1.6	39.71N	112.16W	andesite	FT	zir ap	Lindsey & others (1975)
164	37.3	1.1	40.49N	111.83W	andesite(?)	KA	bio	Crittenden & others (1973)
165	37.5 39.0	2.2	39.81N	112.96W	rhyolite tuff	FT	sp ap	Lindsey & others (1975)
166	37.6	1.2	40.52N	112.14W	monzonite	KA	bio	Moore & others (1968)
167	37.8	1.4	40.52N	112.16W	latite	KA	bio	Moore & others (1968)
168	37.9	1.0	40.51N	112.16W	pegmatite	KA	bio	Moore & others (1968)
169	38.0	1.1	40.45N	112.33W	monzonite	KA	bio	Moore (1973)
170	38.3	1.5	39.78N	112.95W	andesite	FT	zir	Lindsey & others (1975)
171	38.6	1.1	40.50N	112.32W	qtz monzonite	KA	bio	Moore (1973)
172	38.6*	1.3	40.51N	112.16W	monzonite	KA	bio	Moore & others (1968)
173	38.7		40.70N	111.08W	peridotite	KA	WR	Best & others (1968)
174	38.8	0.9	40.53N	112.11W	andesite, trachyandesite	KA	bio	Armstrong (1970)
175	39.0	4	40.58N	111.62W	granodiorite	KA	bio	Armstrong (1966)
176	39.9		40.62N	111.26W	trachyte	KA	mus	Best & others (1968)
177	40.5	1.3	40.51N	112.17W	adamellite	KA	bio	McDowell (1971)
178	40.9 41.2	2.2 3.0	40.60N	111.54W	quartz diorite	FT	zir ap	Crittenden & others (1973)
179	41.0		39.79N	112.58W	granite	KA		Odekirk (1963)
180	42.5	0.8	40.17N	113.83W	adamellite	KA	bio & hbl	Armstrong (1970)
181	43.7 48.0		38.14N	110.73W	porphyry	KA	hbl WR	Armstrong (1969)
182	54.8	1.5	38.57N	109.29W	diorite	KA	hbl	Stern & others (1965)
183	65.0	2	40.00N	113.21W	granodiorite	KA	bio	Edwards & McLaughlin (1972)
184	71.0		39.81N	113.84W	granite	LA	zir	Whelan (1970)

* This sample is in Nevada

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