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Uranium and thorium in samples of rocks
of the White Mountain Plutonic Series, New
Hampshire, and whole rock chemical and
spectrographic analyses of selected samples

By

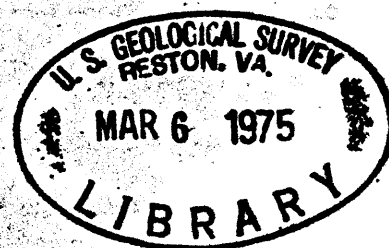
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This report is preliminary and has not been
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Uranium and thorium in samples of rocks
of the White Mountain Plutonic Series, New Hampshire,
and whole rock chemical and spectrographic analyses
of selected samples

By Arthur P. Butler, Jr.
(Compiled by V. P. Byers)

Introduction

Several samples of granitic rocks of the White Mountain Plutonic Series, collected in the course of a reconnaissance study of the uranium and thorium contents of this series of rocks, were analysed for their major and minor constituents. Some of the analytical data thus obtained have been used in published summaries of uranium contents (Larsen and others, 1956; Butler, 1956), of thorium-to-uranium ratios (Butler, 1961), of relations of uranium to some major elements, and of general range minor elements content (Butler, 1967). The complete analytical data were not included in those summaries, but because they may be useful to various people interested in studying these rocks, they are presented here in tables 1-5. Localities of samples are shown on figure 1.

Analyses for major constituents were made by the Geological Survey's rapid method (Shapiro and Brannock, 1956), and most minor elements were determined to half an order of magnitude by semiquantitative spectrographic methods.

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.

[Collected by A. P. Butler, Jr. and others in 1951 and 1954; na, not analyzed.]

Sample no. 1	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
2	N. Doublehead Mtn., 100 ft (30 m) NE. of summit cabin.	Riebeckite granite.	9.6	na
3	Boundary of management area, Sawyers River, Crawford Notch quad.	Riebeckite granite.	14.0	na
5	0.3 mi (0.5 km) E. of BM 1259 Hurricane Mtn. road, N. Conway quad.	Biotite granite, gray.	13.5	na
6	Stony Brook, Hart ledge, Crawford Notch quad.	Pyroxene-fayalite(?) syenite.	2.1	9.5
75	Same as 6.	Same as 6.	1.0	5.9
7	Same as 6. (Value of analysis not entered on map.)	Syenite(?), fine-grained narrow--0.3 ft (0.1 m) wide--dike cutting rock of 6.	17.5	na
8	Natural surface at top "pink" quarry, Redstone, N. H. Same location on map as 39.	Biotite granite, weathered partly gusslike.	6.5	na

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. 1	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
9	NE. and 200 ft (61 m) higher than top of Redstone quarry.	Biotite granite, pink.	10.8	na
10	At BM 1259 Hurricane Mtn. road, N. Conway quad.	Biotite granite.	12.8	na
11	Omitted.			
12	At 580 ft (177 m) elev., Middle Branch Moat Brook, N. Conway quad.	Biotite granite, pink, slightly weathered.	8.0	na
13	Same general location as 12.	Biotite granite, fine-grained, gray, small masses enclosed in rock of 12.	12.0	na
14	50 ft (15 m) W. Redstone mineral spring, N. Conway quad. (Not plotted on map.)	Till(?), sandy, or outwash.	4.2	na
15	On road to Passaconway 2.04 mi (3.3 km), E. of W. edge, Ossipee Lake quad.	Albany-type quartz-syenite, petrographically an amphibole-pyroxene-fayalite.	4.6	na
16	Lower falls of Swift River, N. Conway quad.	Same as 15.	5.8	na

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. 1	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
17	S. Branch Champney Brook 0.07 mi (0.1 km) above top of Champney falls.	Amphibole granite, Mount Osceola type.	7.4	na
18	About 150 ft (46 m) upstream from 17.	Amphibole granite, Mount Osceola type.	4.8	na
19	Railway cut 200 ft (61 m) NW. of south switch Willey House sid- ing, Crawford Notch quad.	Biotite-fayalite-granite mapped as biotite-hasting- site-phase Mount Osceola.	17.0	na
20	SW. end Devils Slide, Percy quad.	Syenite(?), petrographically a pyroxene-olivine (fayalite) granite.	4.0	27.0
21	Same.	Moderately weathered equivalent of 20.	2.1	na
22	At 2,900 ft (884 m), E. side hill 3343, N. end of Pliny Range, Mt. Washington quad.	Quartz monzonite(?)--not yet examined petrographically.	1.9	na
23	0.2 mi (0.3 km) north of fork of Fox Brook, SW 1/9 Percy quad.	Syenite.	1.2	10.2
24	0.6 mi (1 km) SSE. of fork of Fox Brook, Percy quad.	Amphibole granite.	2.3	na

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. 1	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
25	300 ft (91 m) W. of fork of Fox Brook, Percy quad.	Amphibole granite.	2.3	14.0
26	Headwall Ice Gulch, Mt. Washington quad.	Porphyritic biotite-amphibole granite.	6.5	na
27	0.75 mi (1 km) NE. of summit Mill Mtn., Percy quad.	Amphibole granite, riebeckitic.	4.0	na
28	Slope of Mill Mtn., 0.3 mi (0.5 km) N. 65° E. of summit.	Amphibole granite.	3.6	21.0
29	At 2,600 ft (793 m) on N. shoulder of hill 3343, Pliny Range, Mt. Washington quad.	Pyroxene-olivine granite (mapped as hastingsite quartz syenite).	6.8	na
30	On Hancock Branch 6.2 mi (10 km) above paper co. dam, Franconia quad.	Sulfide-bearing, gray-green chlorite-biotite granite.	17.0	na
31	Forest Service road cut at elev. 2,170 ft (661 m) on W. shoulder of hill 3398, Franconia quad.	Biotite granite.	14.5	na
32	At 3,280 ft (1,000 m) on SSW. shoulder Mt. Liberty, Franconia quad.	Granite porphyry.	9.2	na

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. 1	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
33	Roadcut Forest Service road, 1.15 mi (2 km) E. of paper co. dam, Pemigewasset River, Franconia quad.	Amphibole-biotite granite, Mount Osceola.	8.4	na
34	Same roadcut as 33.	Amphibolite-biotite granite, partly porphyritic and slightly less coarse than 33.	6.4	na
35	Rock at upper end slide of June 1948, E. of Profile Lake, Franconia quad.	Medium-fine-grained biotite granite.	7.4	na
36	Cut on east side of old road at The Basin, Franconia quad.	Very coarse biotite granite.	13.1	na
37	SW. wall Rottenstone quarry near recreational area road, Winnepesaukee quad.	Felsite, dike of vent agglomerate.	6.8	na
38	Quarry about 0.7 mi (1 km) NE. of Gilford, Winnepesaukee quad.	Biotite granite.	4.3	30.0
39	NW. corner "pink" quarry, Redstone.	Biotite granite.	14.2	77.0
40	E. end of "green" quarry, Redstone.	Amphibole-biotite granite.	10.0	40.0

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no.	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
41	S. of guard house, summit of Red Hill, Mt. Chocorua quad.	Syenite.	9.5	na
42	At elev. of 1,280 ft (390 m) about 100 ft (31 m) E. of trail on Red Hill.	Nepheline syenite.	1.9	na
43	About 0.1 mi (0.2 km) SW. of presumed position of boundary between monzodiorite and syenite, NW. slope Piper Mtn., Winnepesaukee quad.	Syenite verging on granite.	6.9	33.0
44	At 2d bridge on Belknap Mtn. road.	Syenite.	8.0	25.0
45	About 0.35 mi (0.6 km) SSE. junction State Highways 11A and 11B, Winnepesaukee quad.	Gabbro.	0.9	0.9
46	About 100 ft (31 m) S. of bridge over Cold Brook, S. of South Tamworth.	Rhyolite.	6.0	na
47	Bridge abutment on forest road, at unnamed brook, about 0.5 mi (0.8 km) W. of Swift River, Crawford Notch quad.	Amphibole granite (Mount Osceola).	6.8	26.0

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. ¹	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
48	Same locality as 47.	Amphibole granite (Mount Osceola) slightly finer grained and darker than 47.	7.4	na
49	SE. slope Robbins Ridge, 0.8 mi (1.3 km) west of E. side of N. Conway quad.	Porphyritic biotite granite, slightly weathered.	5.3	43.0
50	About 50 ft (15 m) NW. of Lucy Brook on NW. side of tributary to Lucy Brook, N. Conway quad.	Fine-grained porphyritic biotite rhyolite or granite, probably Moat Volcanics.	12.2	na
51-A	SE. of summit of Iron Mtn., 5 ft (2 m) from contact with Littleton Formation.	Pink biotite granite, weathered. (Petrographically quartz monzonite.)	13.0	na
51-B	Same, 20 ft (6 m) to SW. (Not indicated on map.)	Schist, Littleton Formation, adjacent to contact, weathered.	4.9	na
52	E. slope of Mt. Willard, 100 ft (31 m) above railroad track, Crawford Notch quad.	Porphyritic chlorite-biotite granite 1-2 ft (0.3-0.6 m) from contact with Littleton Formation.	15.2	52.0
53	Same as 52.	Same, 5-6 ft (1.5-1.8 m) from contact.	14.0	na

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. ¹	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
54	Same as 52.	Schist, Littleton Formation, impregnated with granite.	6.6	na
55	Same as 52.	About same as 52, but 25-30 ft (8-9 m) from contact with schist.	13.0	na
56	Abandoned quarry E. foot B and M Ledge, Ossipee Lake quad.	Pink coarse-grained biotite granite.	10.0	na
57	Roadcut 0.4 mi (0.6 km) W. of RR. crossing west of Bartlett.	Pink coarse-grained biotite granite.	7.4	40.0
58	Same as 57.	Partly weathered grusslike rock at top of outcrop across road from 57.	5.7	na
59	Same as 57.	Fine-grained biotite quartz-monzonite in dike-like mass cutting rock of 57.	21.0	na
60	About 3,000 ft (915 m) elev. on NW. shoulder Bear Mtn.	Green to gray amphibole granite.	3.6	25.0
61	0.5 mi (0.8 km) E. of divide in Hancock Notch.	Medium-grained gray-white rock, petrographically a quartz monzonite.	17.0	35.0

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no.	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
62	About 1,820 ft (555 m) elev., on S. slope Bear Mtn,	Amphibole-biotite granite, Mount Osceola type.	9.3	na
63	Brunel trail on W. side of Owls Cliff.	Medium-coarse grained biotite granite.	10.4	na
64	At 1,520 ft (443 m) elev., E. of Brook trail on tributary of Claybank Brook, SW. slope of Mt. Chocorua.	Gray-green biotite-amphibole granite	14.6	54.0
65	Pit in N. Conway, 200 ft (61 m) W. of Kearsarge Road.	Pale-pink biotite granite moderately disintegrated.	7.0	na
66	N. side tributary of Lucy Brook, about 0.35 mi (0.6 km) upstream from main brook.	Porphyritic biotite rhyolite, Moat Volcanics.	11.2	na
67	N. side forest road, opposite paper co. dam on E. Branch Pemigewasset River.	Biotite-amphibole granite mapped as Mount Osceola.	10.2	42.0
68	About 1,970 ft (600 m) elev. on N. side tributary of Hancock Branch, Franconia quad.	Biotite granite, somewhat weathered.	7.5	33.0
69	On N. bank East Branch Pemigewasset River, at contact with Telford schist.	Medium-grained granitoid rock petrographically biotite-albite granodiorite.	10.8	na

Table 1.--Summary of locations from which samples of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no.	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
70	Same general location as 69, but 2-4 ft (.6-1.2 m) from contact.	Medium-coarse-grained biotite granite.	8.3	na
71	E. bank Pemigewasset River, south of The Pool.	Pink biotite granite.	14.2	na
72	SW. shoulder Iron Mtn. at about 2,180 ft (665 m) elev., N. Conway quad.	Biotite granite, partly weathered.	13.7	na
73	About same as 72, adjacent to biotite granite.	Littleton Formation, quartz biotite-feldspar schist.	4.5	na
74	Bemis Brook about 0.4 mi (0.6 km) W. Willey House P. O.	Fine-grained biotite granite, Black Cap phase of Conway.	15.5	na
301	10 ft (3 m) W. of road south of Chatham, N. Conway quad.	Pink porphyritic biotite granite in vicinity of contact with older rock.	7.5	na
302	In river bed, Jackson Falls, N. Conway quad.	A porphyritic amphibole-biotite granite, Albany-quartz-syenite type.	4.4	na
303	Same general locality.	Not analyzed.		
305	Road W. from Ossipee Valley, inner ring dike, Ossipee Lake quad.	Porphyritic quartz syenite.	12.0	na

Table 1.--Summary of locations from which samples of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued.

Sample no. ¹	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
306	On road between Mt. Church and Mt. School.	Pink biotite granite.	5.1	na
307	Summit Profile Mtn.	Pink biotite quartz monzonite, somewhat weathered.	14.2	32
310	On forest service rd, 8.8 mi (14 km) E. of bridge over E. Branch Pemigewasset River.	Pink biotite granite.	9.1	na
311	Same road as 310, 7.4 mi (12 km) E. of bridge.	Biotite granite or quartz monzonite.	17.4	na
312	Same road as 310, 6.2 mi (10 km) E. of bridge.	Biotite granite.	17.2	na
313	Fletchers quarry, B and M Ledge, Ossipee Lake quad.	Pink biotite granite or quartz monzonite.	11.2	na
315	At contact on Mad River below Sixmile Bridge, Plymouth quad.	Biotite granite.	3.3	na
316	On Drakes Brook, east of road to Waterville from locality of 315.	Biotite granite, somewhat weathered.	11.5	na
317	Blasted ledge 0.7 mi (1 km) E. Stony Brook Trail, N. Conway quad.	Quartz syenite, Albany type.	16.8	na

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. ¹	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
321	Lower falls of the Ammonoosuc River, Mt. Washington quad.	Coarse-grained granitic rock, petrographically a topaz-bearing biotite quartz monzonite.	25.5	69.0
323	N. of end of unnamed trail W. of Lonely Lake, at contact with binary granite.	Biotite-amphibole granite, somewhat weathered.	12.8	na
324	1.9 mi (3 km) SW. of Rust pond, Perrault quarry, Wolfboro.	Plagioclase-rich granitic rock.	3.5	18.7
325	On roadside at W. end of Merry Meeting Lake, Alton quad.	Pinkish-gray biotite-amphibole quartz monzonite.	6.0	na
327	In stream above E. entrance to Davis Top Road, Ossipee Lake quad.	Light pink granitic rock.	3.4	na
328	Approximately at margin of Conway granite W. of York Lake, Mt. Washington quad.	Pink coarse-grained porphyritic biotite granite.	10.2	na
329	In quarry about 0.5 mi (0.8 km) W. York Lake Fish Hatchery.	Biotite quartz monzonite, (Conway Granite).	10.5	na
330	Near contact at end of road N. of Christine Lake, Percy quad.	Pink granite, somewhat weathered.	na	na

Table 1.--Summary of locations from which samples of rocks of the White Mountain Plutonic Series, New Hampshire, were collected and analyzed.--continued

Sample no. ¹	Location	Rock type	Uranium ² (parts per million)	Thorium ³ (parts per million)
331	W. of Rowells Brook, N. of road on N. side of Christine Lake, Percy quad.	Pink medium-coarse-grained granitic rock, petrographically a biotite quartz monzonite.	10.7	na
332	About 1,600 ft (488 m) elev. on Rowells Brook logging road.	Slightly porphyritic coarse-grained biotite granite.	9.6	44.0
333	Ridge SE. of Moore Mtn., Percy quad.	Medium-grained granitic rock, petrographically a biotite quartz monzonite.	11.5	na

¹Sample Nos. 2 to 75 carry prefix BNH-; Nos. 301 to 333 carry prefix SNH.

²Uranium analyses by P. W. Scott, Marian Schnepfe, Marjorie Malloy, Roosevelt Moore, Alice B. Caemmerer, Esma Campbell, Lillie Jenkins, and A. M. Sherwood.

³Thorium analyses by Roosevelt Moore, Alice B. Caemmerer, Esma Campbell, and Lillie Jenkins.

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