69-16-P

CONTINUED EVALUATION OF NORTH CAROLINA FELDSPAR ORES - REPORT 3
July 1969 Progress Report

(Lab. Nos. - See Table 1) - Book 224

by
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Description of Project

This report is the third of a series describing the evaluation of possible new sources of feldspar in North Carolina, begun in the spring of 1967. Test and evaluation procedures are substantially identical to standard procedures described in Section B of the December 1967 Progress Report. The two reports preceding this one were: 1) that of December 1967, just cited, and 2) Section B, December 1968 Progress Report.

Location and Description of Samples

Table 1 gives general descriptions of locality and ore in the case of each sample. It is a continuation of Table 1 in both of the two previous reports. Table 2 of this report is likewise a continuation of Table 2 in both preceding reports, and it gives quantitative data on concentrates obtained.

Best Ores from Program to Date

An attempt is made here to select the best samples from this and the previous two reports (December 1967 and December 1968) to see if any particular areas of North Carolina appear to contain more promising feldspar ores. Study of the quantitative data developed since 1967 shows

that, among the more promising ores, there can be either a relatively high yield of feldspar analyzing perhaps five to six percent K_2O, or sometimes a lower yield assaying in the 12 to 13 percent K_2O range, with intermediate yields having intermediate K_2O analysis. Feldspar having high K_2O analysis is of greater economic value, so this helps to offset lower yield. In appraising samples, therefore, both yield and K_2O level should be considered. Some yardstick for evaluation of many feldspar products of varying yields and assays is needed and an attempt to meet this need is hereby made.

In any given test, the percent yield of nonmagnetic feldspar (weight percent of original sample) can be multiplied by the percent K_2O in the total feldspar product to secure an empirical rating figure. With an ore having a low feldspar yield but high K_2O assay, the rating figure may come close to that of another ore having a higher yield but lower K_2O assay. Table 3 lists those samples which, on this basis for evaluation, appear most promising. For the time being the degree of success in removal of iron minerals is not being considered. Additional research along this line may be needed on selected samples. In any event it appears that the more promising samples were generally more easily beneficiated in this respect.

Using the rating system mentioned, an ore with a feldspar yield of 20 percent and with a K_2O assay of 14 percent would have a rating of 280. A yield of 45 percent with an assay of about 6.25 percent K_2O would also score 280. In compiling Table 3, the rating figure of 280 was arbitrarily selected as the minimum acceptable. Alaskite feldspar ore

Table 1

Location and Description of Forty-Seven Samples Processed
December 1968 to July 1969

Field Sample No.	Lab Sample No.	General Location or Source*	Description of Ore
FG-47	3216	Henderson Co., on Turkey Mtn.Rd.	Weathered Whiteside granite
-	3311	Davie Co., near Smith Grove	Hard foliated pink granite
FG-48	3338	Davidson Co., at Boone's Cave	Semi-weathered porphyrite granite
FG-49	3339	Ditto	Well-weathered porph.granite
FG-50	3340	Davidson Co., near intersection of Rds. 1167 and 1162	Weathered porphyritic granite
FG-51A	3341	Davidson Co., same general location	Ditto, somewhat finer-grained than 3340
FG-51B	3342	Davidson Co., same general location	Ditto, somewhat coarser-grained than 3340
FG-52	3343	Davidson Co., intersection of Rd. 1186 and Gobble Creek	Weathered porph. gran.
FG-53	3344	Davidson Co.,near intersection of Rd. 1192 and U.S. 64	Ditto
FG-54A	3345	Davidson County, old quarry on Rock Crusher Rd.	Weathered quartz monzonite
FG-54B	3346	Ditto	Fresh quartz monzonite
FG-55	3347	Davie Co., near intersection of N.C. 801 and U.S. 64	Weathered porph.granite
FG-56	3348	Davie Co., on N.C. 801, 2 mi. N.E. of intersection with U.S.64	Semi-weathered granite
FG-57	3349	Davie Co., near intersection of Rds. 1650-1652	Semi-weathered porph.gran.
FG-58	3350	Davie Co.,Rd. 1617 near inter. with N.C. 801	Weathered porph. granite
FG-59	3351	Davie Co.,near intersection of N.C. 801 & Rd. 1801	Semi-weathered granite gneiss
FG-60A	3352	Davie Co., on Rd. 1819 near intersection with Rd. 1820	Weathered porph. granite
FG-60B	3353	Davie Co., on Rd. 1819 near intersection with Rd. 1820	Fresh porph. granite
FG-61	3354	Davie Co., on Rd. 1822, south of intersection with Rd. 1819	Semi-weathered porph. granite
FG-62	3355	Davie Co., on N.C. 801 at Dutchman's Creek	Ditto

(Table 1 continued on next page)

*Further details on location can be furnished

Table 1

(continued from page 3)

Location and Description of Forty-Seven Samples Processed December 1968 to July 1969

Field Sample No.	Lab Sample No.	General Location or Source*	Description of Ore
FG-63	3356	Davidson Co., near intersection of Rd. 1440 and 1435	Weathered porph. granite
FG-64	3357	Davidson Co., near intersection of N.C. 150 and Rd. 1441	Semi-weath. porph. granite
FG-65	3358	Davidson Co., near intersection of Rds. 1485 and 1489	Weathered porph. granite
FG-66	3359	Davidson Co., on Rd. 1493 at Muddy Creek	Weathered granite, slightly porphyritic
FG-67A	3360	Iredell Co., on Rd. 1109 on east bank of Lake Norman	Weathered coarse monzonite
FG-67B	3361	Ditto	Semi-weath. coarse monzonite
FG-68	3362	Iredell Co., intersection of Rd. 1153 and Coddle Creek	Weath. porph. granite
FG-69	3363	Davidson Co., near intersection of Rd. 1155 and N.C. 150	Semi-weath. porph. granite
FG-70	3364	Davidson Co., near intersection of N.C. 150 and Rd. 1499	Semi-weath., slightly porphyritic granite
FG-71	3365	Davidson Co., 1/2 mile south of Rds. 1813 and 1803	Weath. qtz. monzonite
FG-72	3366	Davidson Co., near intersection of Rds. 1516 and 1517	Ditto
FG-73	3367	Davidson Co., near intersection of Rds. 1516 and 1520	Porph. granite, foliated
FG-74	3368	Davidson Co., near intersection of Rds. 1493 and 1490	Slightly porphyritic granite
FG-75	3369	Davidson Co., at intersection of Rds. 1700 and 1798	Qtz. monzonite at contact of amphibolite & Car.gneiss
FG-76	3370	Davidson Co., near intersection of Rds. 1176 and 1172	Hand-picked crystals of relatively pure feldspar
FG-82	3475	McDowell Co., east of inter. of Rds. 1108 and 1106	Weath. porphyroblastic granite gneiss
FG-83	3476	Buncombe Co., near intersection of N.C. 9 and Rd. 2797	Hard granite gneiss
FG-84	3477	Ditto	Weathered equivalent of previous
FG-85	3478	Buncombe Co., on N.C. 9 near Broad River Ch.	Semi-weathered granite gneiss
FG-86	3479	Buncombe Co., near intersection of Rd. 2802 and N.C. 9	Weathered gran. gneiss

(Table 1 continued on next page)

*Further details on location can be furnished

Table 1

(continued from page 4)

Location and Description of Forty-Seven Samples Processed December 1968 to July 1969

Field Sample No.	Lab Sample No.	General Location or Source*	Description of Ore
FG-87	3480	Buncombe Co., near intersection of Rd. 2802 and N.C. 9	Fresh equivalent of 3479
FG-88	3481	Buncombe Co., near intersection of Rd. 2802 and N.C. 9	Weath. gran. gneiss
FG-89	3482	Buncombe Co., at intersection of N.C. 9 and Rd. 2797	Hard chunks, fresh gran. gneiss
FG-90	3483	Buncombe Co., near intersection of N.C. 9 and Rd. 2797	Weath. gran. gneiss
FG-91	3484	Ditto	Ditto
-	3487	Mitchell Co., Chalk Mountain	"Horse" of biotite schist, from mine
FG-92	3493	Buncombe Co., near Leicester Post Office	Pyroxene-bearing granite

*Further details on location can be furnished

Table 2

Quantitative Results, Forty-Seven Samples Processed, Dec. 1968 to July 1969

Field Sample No.	Lab Sample No.	FP #1 Micaceous % Wt	FP #2 Fe-Minerals % Wt	FP #3 Feldspar % Wt	MD Qtz % Wt	Slime Loss % Wt	Nonmag Spar % of Hd.Fd
FG-47	3216	3.7	8.7	25.4	32.9	29.3	19.8
-	3311	1.1	8.0	51.6	14.5	24.9	45.3
FG-48	3338	7.1	7.9	53.2	14.6	17.2	41.9
FG-49	3339	3.5	14.2	43.5	16.8	22.0	38.8
FG-50	3340	2.9	6.7	28.6	20.6	41.2	26.3
FG-51A	3341	0.8	1.7	12.7	15.2	69.6	10.0
FG-51B	3342	7.5	2.5	17.5	41.2	31.3	10.0
FG-52	3343	0.8	1.0	19.1	31.8	47.2	16.2
FG-53	3344	1.8	1.5	15.5	20.9	60.4	12.1
FG-54A	3345	1.7	2.0	33.0	29.8	33.4	21.8
FG-54B	3346	3.9	4.9	46.3	23.2	21.6	37.0
FG-55	3347	6.5	2.7	29.3	28.8	32.7	23.2
FG-56	3348	10.8	3.3	26.0	29.8	30.1	19.6
FG-57	3349	8.7	35.0	10.5	20.6	25.2	9.4
FG-58	3350	4.8	2.3	21.6	29.6	41.7	18.0
FG-59	3351	3.8	5.1	53.9	20.1	17.1	42.9
FG-60A	3352	9.9	5.1	31.0	30.3	23.8	25.4
FG-60B	3353	10.0	13.1	18.1	37.3	21.5	14.6
FG-61	3354	9.0	6.8	20.2	35.5	28.5	15.0
FG-62	3355	10.6	11.2	27.9	18.6	31.7	25.8
FG-63	3356	2.5	2.2	18.7	21.7	54.9	16.9
FG-64	3357	11.1	14.1	25.4	24.0	25.4	21.7
FG-65	3358	6.5	3.7	33.8	18.1	37.9	29.1
FG-66	3359	4.2	3.7	45.3	22.0	24.9	43.1
FG-67A	3360	7.1	3.0	32.4	29.0	28.5	28.6
FG-67B	3361	6.8	3.9	30.6	35.9	22.8	27.1
FG-68	3362	8.9	1.9	31.4	18.4	39.5	29.8
FG-69	3363	8.3	6.1	31.6	27.4	26.6	29.9
FG-70	3364	12.5	8.4	26.9	29.8	22.4	26.2
FG-71	3365	4.6	8.6	34.1	28.7	24.0	32.0
FG-72	3366	5.3	3.7	35.5	33.2	22.3	32.3
FG-73	3367	5.4	8.2	43.7	18.0	24.7	41.7
FG-74	3368	2.4	1.2	19.1	24.1	52.2	17.9
FG-75	3369	0.9	4.7	44.7	22.1	27.6	40.1
FG-76	3370	1.3	1.5	70.5	4.2	22.5	64.9
FG-82	3475	10.3	3.6	32.3	16.3	29.2	30.7
FG-83	3476	11.0	1.9	48.0	18.5	20.7	45.1
FG-84	3477	6.4	3.6	34.8	24.5	30.7	32.5
FG-85	3478	5.6	2.3	44.8	20.9	26.2	42.6
FG-86	3479	12.6	1.9	33.5	25.1	26.9	31.9
FG-87	3480	6.7	2.0	48.1	23.7	19.5	46.2
FG-88	3481	7.6	23.1	← 42.9 →		26.4	-
FG-89	3482	11.6	5.1	38.6	21.2	23.5	35.7
FG-90	3483	26.2	0.6	13.1	23.0	37.1	12.3
FG-91	3484	5.7	2.3	40.9	24.8	26.3	37.5
-	3487	20.7	11.3	24.4	20.0	23.6	20.7
FG-92	3493	0.8	23.6	30.2	14.7	30.7	27.1

*Listed only when K_2O is at least 8.5% and nonmag. spar product is at least 19% of head feed

(1) Standard procedures did not produce good separations. Further tests could be run for improvement on the seven tests noted

Coarse Spar					Fine Spar				
Screen Class.	% of Hd. Feed	Chemical Analysis K_2O	Na_2O	Fe_2O_3	Screen Class.	% of Hd. Feed	Chemical Analysis K_2O	Na_2O	Fe_2O_3
+60	9.4	13.66	1.51	0.07	-60	10.4	13.30	1.73	0.07
+60	17.9	6.67	3.32	0.09	-60	27.4	6.79	3.32	0.07
+60	22.7	6.50	4.16	0.16	-60	19.2	6.50	4.55	0.12
+60	17.3	7.03	3.77	0.12	-60	21.5	6.76	4.16	0.12
+60	11.9	12.30	2.38	0.11	-60	14.4	10.10	3.46	0.10
+60	3.9	13.11	1.08	0.19	-60	6.1	13.11	1.08	0.17
+60	3.0	12.00	2.13	0.13	-60	7.0	10.79	2.87	0.13
+60	6.1	14.45	0.72	0.14	-60	10.1	14.13	0.73	0.13
+60	4.5	14.13	0.96	0.15	-60	7.6	13.51	0.96	0.15
+60	7.4	14.00	0.85	0.10	-60	14.4	12.58	1.93	0.11
+60	14.8	6.80	4.69	0.20	-60	22.2	6.53	4.91	0.11
+60	10.8	12.80	1.74	0.11	-60	12.4	10.90	2.86	0.11
+100	10.6	11.01	2.60	0.14	-100	9.0	7.34	4.06	0.07
-	9.4	9.46	3.36	0.07	(No split made)				
+60	7.7	14.10	0.96	0.11	-60	10.3	13.50	1.43	0.12
+60	13.8	3.55	5.31	0.10	-60	19.1	4.07	5.31	0.07
+100	15.7	7.36	3.59	0.10	-100	9.7	6.29	4.81	0.09
+100	8.8	7.89	3.57	0.09	-100	5.8	6.01	5.06	0.09
+100	10.2	8.84	3.57	0.10	-100	4.8	6.67	5.03	0.09
+60	7.6	9.16	3.54	0.11	-60	18.2	8.25	3.87	0.08
+100	11.1	13.51	1.03	0.13	-100	5.8	13.20	1.03	0.11
+100	14.6	8.48	3.57	0.09	-100	7.1	6.50	4.44	0.09
+60	10.6	11.39	2.62	0.08	-60	18.5	9.91	3.09	0.08
+60	16.8	6.59	4.38	0.12	-60	26.3	5.09	5.38	0.09
+60	10.0	12.81	1.73	0.07	-60	18.6	11.51	2.40	0.05
+60	9.7	13.60	1.30	0.07	-60	17.4	11.30	3.28	0.06
+100	19.7	11.68	1.78	0.09	-100	9.1	11.30	2.11	0.08
+100	19.4	8.56	3.85	0.10	-100	10.5	6.48	4.50	0.08
+100	16.0	11.30	2.38	0.05	-100	10.2	7.98	3.60	0.04
+60	12.2	11.21	2.38	0.11	-60	19.8	9.95	2.99	0.06
+100	19.2	8.61	3.60	0.14	-100	13.1	6.07	5.81	0.07
+100	26.5	6.25	5.46	0.10	-100	15.2	5.07	6.12	0.09
+60	7.0	14.89	1.63	0.10	-60	10.9	13.33	1.36	0.04
+100	21.8	0.41	8.54	0.16	-100	18.3	0.41	8.14	0.15
+100	39.2	13.12	1.53	0.09	-100	25.7	12.60	2.09	0.08
+150	15.7	10.01	2.60	0.14	-150	15.0	8.52	3.68	0.12
+100	25.2	4.72	4.26	0.14	-100	19.9	5.47	4.36	0.07
+150	19.5	4.10	5.35	0.11	-150	13.0	4.95	5.41	0.10
+150	22.9	6.90	3.66	0.10	-150	19.7	6.68	4.72	0.10
+100	13.0	3.98	6.22	0.13	-100	18.9	4.42	6.22	0.13
+150	28.6	3.75	6.77	0.05	-150	17.6	4.44	6.75	0.05
(No spar float.		Spar plus quartz analysis, nonmag							
+150	15.0	6.71	4.02	0.07	-150	20.7	6.26	5.62	0.07
+100	6.2	8.83	3.57	0.10	-100	6.1	8.60	3.57	0.08
+150	21.8	8.36	3.31	0.06	-150	15.7	7.26	5.59	0.07
+150	15.6	0.41	8.04	0.16	-150	5.1	0.37	8.65	0.10
+100	15.7	9.85	2.58	0.15	-100	11.4	8.78	2.80	0.09

Quartz Chemical Analysis			Nonmag Quartz	Composite Spar Analysis*		
				%	%	Approx.%
K_2O	Na_2O	Fe_2O_3	% of Hd. Fd.	K_2O	Na_2O	Fe_2O_3
0.07	0.02	0.03	27.8	13.47	1.24	0.07
0.19	0.10	0.01	12.4			
0.03	0.05	0.03	13.7			
0.14	0.22	0.12	14.8			
0.16	0.04	0.03	18.7	11.10	2.97	0.11
0.07	0.03	0.01	11.5			
5.30	2.94	0.11	34.4(1)			
0.07	0.04	0.017	28.2			
0.03	0.02	0.02	18.7			
0.13	0.06	0.04	25.7	13.06	1.56	0.11
0.20	0.20	0.04	19.4			
0.79	1.23	0.09	25.4	11.78	2.34	0.11
1.94	1.05	0.07	20.8(1)	9.33	3.27	0.10
2.66	2.34	0.05	19.4(1)			
1.05	0.60	0.11	23.8			
0.10	0.21	0.02	17.4			
2.66	2.34	0.07	26.8(1)			
3.58	3.30	0.08	33.5(1)			
4.14	2.98	0.08	31.4(1)			
0.10	0.17	0.02	17.0	8.52	3.77	0.10
0.20	0.23	0.10	20.0			
1.64	1.01	0.05	23.9			
0.08	0.06	0.02	16.2	10.45	2.92	0.08
0.05	0.14	0.01	20.4			
0.14	0.20	0.02	26.1	11.97	2.16	0.06
1.09	0.55	0.02	32.5	12.12	2.57	0.07
0.13	0.03	0.03	18.2	11.17	1.82	0.09
1.28	0.66	0.05	26.6			
0.26	0.29	0.02	29.3	10.00	2.85	0.05
0.08	0.03	0.02	28.1	10.43	2.76	0.08
2.15	1.39	0.06	32.1(1)			
0.05	0.06	0.03	17.4			
0.08	0.06	0.03	23.5			
0.29	0.05	0.05	20.8			
1.09	0.64	0.17	(No mag. sep.)	12.91	1.75	0.09
0.15	0.07	0.11	15.2	9.12	3.13	0.13
0.16	0.12	0.06	17.7			
0.16	0.16	0.05	23.0			
0.14	0.09	0.06	19.8			
0.07	0.04	0.07	24.3			
0.10	0.10	0.03	22.9			
0.23	6.46	0.13)	34.9(spar+qtz)			
0.07	0.09	0.04	20.1			
0.04	0.07	0.05	22.2			
0.09	0.06	0.04	23.4			
0.05	0.24	0.03	19.2			
0.40	0.36	0.09	13.1			

from the Spruce Pine area yields in the neighborhood of 60 percent feldspar, assaying close to five percent K_2O, thus being rated at 300. In another case, a spiral mica plant tailing which is beneficiated for feldspar contains about 25 percent feldspar assaying about 13 percent K_2O, giving it a rating of 325. Thus, a rating cutoff point of 280 allows some margin below the rating of some commercial ores.

Location of Best Ores

Table 4 gives the locations of all samples shown on Table 3. Table 4 repeats some data from Table 1 of each of the three reports to date: December 1967, December 1968 and this one.

For further clarification, a map of North Carolina is furnished to depict the general areas of collection of these 21 most promising samples (Figure 1). All have been collected from the heavily-outlined areas on this map which have been numbered 1, 2, and 3.

Geology and Mineralogy

As stated in the above paragraph, the State of North Carolina was divided into three areas of primary investigations. These areas were chosen either because they were underlain by extensive granitic plutons or because the overall composition of the underlying rocks indicated high potassium feldspar content.

Other geologic belts of granitic gneisses and granitic plutons, such as the Cranberry, Blowing Rock, Max Patch, and Beech granite gneisses and the series of granitic plutons east of Raleigh, are now being considered for feldspar evaluation, and in certain instances sampling is underway.

Table 3

Ratings of Best Feldspar Ores Processed to July 1969

Lab Sample No.	Nonmag. Spar Product % Yield From Ore	% K_2O	Rating	% Fe_2O_3 Assay	Progress Report Date
3129A	56.2	6.0	337(1)	0.07	December 1968
3137	35.3	8.6	304	0.10	December 1967
3139	47.3	6.4	303	0.09	December 1967
3141	30.2	10.5	317	0.09	December 1967
3145	33.2	9.6	319(2)	0.13	December 1967
3148	38.2	8.0	306	0.13	December 1967
3149	34.0	10.8	367(3)	0.10	December 1967
3187	32.3	10.8	349	0.09	December 1967
3203	31.5	8.9	280	0.14	December 1968
3214	28.3	12.6	357	0.05	December 1968
3311	45.4	6.7	304	0.08	July 1969
3340	26.3	11.3	297	0.14	July 1969
3345	21.8	13.1	286	0.11	July 1969
3360	28.6	12.0	343	0.06	July 1969
3361	27.1	12.0	325	0.06	July 1969
3362	27.5	11.6	319	0.08	July 1969
3365	32.0	10.5	336	0.09	July 1969
3370	64.8	12.9	836(4)	0.09	July 1969
3475	30.4	9.4	286	0.13	July 1969
3478	42.7	6.8	290	0.10	July 1969
3484	37.5	7.9	296	0.07	July 1969

(1) Highest rating, 5-8.5% K_2O range
(2) " " 8.5-10% K_2O range
(3) " " 10.0-12.0% K_2O range
(4) " " 12+ % K_2O range - See also remarks

Table 4

Location and Description of Most Promising Samples

Field Sample No.	Lab Sample No.	General Location or Source	Description of Ore
-	3129A	Wake Co., Rolesville Quarry	Granite fines, -1/8"
FG-10	3137	Rowan Co., Rockwell Quad., near inter. of Shives and Shupings Mill Roads	White biotite-granite, weathered, from Starr quarry
FG-12	3139	Rowan Co., Statesville Quad., near inter. of Rds. 1211 & 1533	Weathered granite, large pieces of potash spar
FG-14	3141	Rowan Co., Statesville Quad., near inter. of Rds. 1350 & 1554	Coarse-grained porph. granite
FG-18	3145	Rowan Co., Statesville Quad., near inter. of Rds. 1954 & 1953	Fine material, porphyritic
FG-21	3148	Rowan Co., Statesville Quad., near inter. Deals Creek & Rd. 1910	Porphyritic biotite granite
FG-22	3149	Rowan Co., Statesville Quad., inter. of 3rd Creek & Rd. 1702	Crushed, weathered granite: Woodleaf quarry
FG-30	3187	Henderson Co., Horse Shoe Quad., 1 mi. north of Crab Creek Church on Rd. 1133	Soft, weathered Henderson granite gneiss
FG-38	3203	Cabarrus Co., northwest part of Co., edge of Kannapolis	Weathered porphyritic granite
FG-45	3214	Henderson Co., Bane Rd., south of Tonawanda	Weathered Whiteside granite
-	3311	Davie Co., near Smith Grove	Hard foliated pink granite
FG-50	3340	Davidson Co., near intersection of Rds. 1167 and 1162	Weathered porphyritic granite
FG-54A	3345	Davidson Co., old quarry on Rock Crusher Rd.	Weathered quartz monzonite
FG-67A	3360	Iredell Co., on Rd. 1109 on east bank of Lake Norman	Weathered, coarse monzonite
FG-67B	3361	Ditto	Semi-weath. coarse monzonite
FG-68	3362	Iredell Co., intersection of Rd. 1153 and Coddle Creek	Weath. porph. granite
FG-71	3365	Davidson Co., 1/2 mile south of Rds. 1813 and 1803	Weath. qtz. monzonite
FG-76	3370	Davidson Co., near intersection of Rds. 1176 and 1172	Hand-picked crystals of relatively pure feldspar
FG-82	3475	Buncombe Co., east of inter. of Rds. 1108 and 1106	Weath. porphyroblastic granite gneiss
FG-85	3478	Buncombe Co., on N.C. 9 near Broad River Ch.	Semi-weathered granite gneiss
FG-91	3484	Buncombe Co., near intersection of N.C. 9 and Rd. 2797	Weath. gran. gneiss

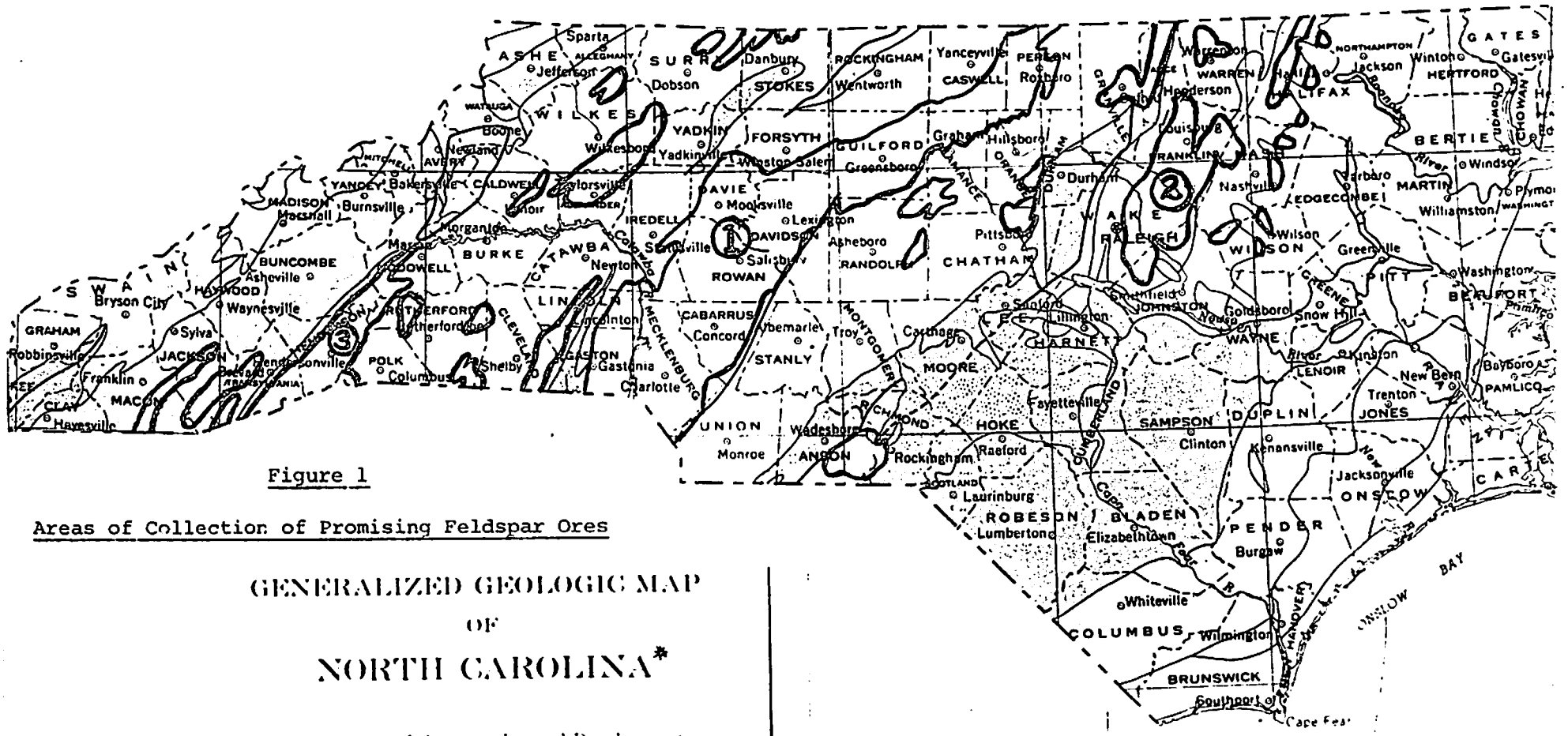

Figure 1

Areas of Collection of Promising Feldspar Ores

GENERALIZED GEOLOGIC MAP OF NORTH CAROLINA*

Department of Conservation and Development
Dan E. Stewart, *Director*

Division of Mineral Resources
Stephen G. Conrad, *State Geologist*

1966

SCALE

40 0 40 80 MILES

*Alterations & additions made by MRL

Area 1 Charlotte Belt		Area 2 Rolesville-Wendell-Knightdale Granite	Area 3 Henderson-Whiteside Formations
3137	3340	3129 A	3187
3139	3345		3214
3141	3360		3475
3145	3361		3478
3148	3362		3484
3149	3365		
3203	3370		
3311			

The following comments, however, will deal primarily with the three areas shown in Figure 1.

Rolesville - Wendell - Knightdale Area - The Rolesville-Wendell-Knightdale granite area which is shown in Figure 1 as Area 2, includes parts of Wake, Johnston, Franklin, Nash and Vance Counties.

The granite in the vicinity of the town of Rolesville at the Rolesville quarry is a massive light gray to pinkish-gray medium grained rock consisting of 30 percent quartz, 34 percent orthoclase and microcline, 28 percent plagioclase, seven percent biotite and one percent chlorite, sericite and apatite (Councill, R. J., 1954, p. 18).

Compositional variations of the granite in Area 2, i.e. increased orthoclase-microcline content and decreased plagioclase content, tend to justify further sampling.

No samples from the Wendell-Knightdale area have thus far been obtained. However, published data dealing with the composition of the granites in this area show the following compositional ranges: orthoclase 34 to 49 percent, microcline one to 11 percent, plagioclase 0 to 21 percent, quartz 32 to 42 percent, perthite two to five percent, biotite 0 to eight percent, and muscovite 0 to three percent (Councill, 1954, p. 20). The high orthoclase-microcline content strongly suggests a potential source of high potash feldspar.

Charlotte Belt - Area one comprises a portion of the Central Piedmont underlain by Paleozoic granitic intrusives, known collectively as the Charlotte Belt which extends from the North Carolina-South Carolina boundary in Mecklenburg and Gaston Counties, northeast to Person County. Area one is the most widely sampled of the three areas.

Generally, the Charlotte Belt consists of a wide variety of granitoid intrusive rocks ranging from syenite to quartz-monzonite. In the northern portion of the belt (Guilford, Alamance, Caswell, and Person Counties) the granitic rocks finger out into biotite gneisses, schists, and volcanic rocks. Within this area the wide variation in rock type and more mafic composition tend to make the feldspar products obtained higher in Fe_2O_3 and lower in potash feldspar.

Approximately seventy samples for feldspar evaluation have been collected from the Charlotte Belt. The majority of these samples have come from Rowan, Davie, Davidson, Iredell, and Cabarrus Counties, which lie in the central portion of the Charlotte Belt. The granite plutons of interest in this area are as follows: the Salisbury granite, the Woodleaf granite, "the porphyritic granite", and the Landis granite.

The Salisbury granite (adamellite) from which samples 3132A-3137* were collected lies in south central Rowan County. The pluton covers an area of approximately 18 square miles and is extensively quarried for dimension granite. The granite is a massive to slightly foliated medium grained rock which ranges in color from gray to pink to blue. The rock consists of about 40 percent plagioclase, 26 percent potassium feldspar, 30 percent quartz with accessory biotite, muscovite, sphene, chlorite, epidote, garnet, monazite, calcite, fluorite, and staurolite (Phillips, E. L., 1967).

Of the samples collected from this pluton, Nos. 3132A, 3134B, 3135A, and 3137 gave the best feldspar concentrates. The average chemical analysis of these concentrates was 10.35 percent K_2O, 3.09 percent Na_2O and 0.11 percent Fe_2O_3. All of the above samples were weathered to the

* Area locations of all samples taken are listed in Table 5

extent that the K_2O content was greatly increased over that of unweathered granite of the same type.

The potential of the Salisbury granite lies first in the possible utilization of the tailings from granite quarrying operations as a by-product in the production of feldspar, and second in the location of an extensive uniformly weathered zone of granite which could be mined directly for feldspar.

The Woodleaf granite area is located in northwestern Rowan County and consists of a granite-gabbro complex with possible inclusions of volcanic rocks. Presently, tailing samples from the Woodleaf quarry are being evaluated for potential feldspar.

The Landis granite is a porphyritic granite located in the Landis-Kannapolis area of southwestern Rowan and northwestern Cabarrus Counties. A smiliar granite outcrops a few miles northwest of this area, near Mt. Ulla, Rowan County and is possibly an extension of the Landis granite.

The following description of the Landis granite was reported by Watson and Laney (1906, p. 95):

> ".....,, a biotite granite composed principally of orthoclase, microcline and microperthitic intergrowths, much plagioclase, quartz and biotite. The biotite is much altered to chlorite and is frequently crowded with inclusions. The feldspar contains a considerable proportion of included small particles of black iron oxide. Occasional crystals of titanite are noted in thin section."

Sample numbers 3138, 3139, 3140, 3141, 3142, 3143, 3144, and 3203 were obtained from both the northwest extension of the Landis granite and from the Landis granite itself. Feldspar products from 3141, 3143, and

3203 show fairly high K_2O content ranging from 8.9 percent for 3203 to 12.33 percent for 3143.

Although the central geographic portion of the Landis pluton is highly urbanized and sampling is difficult, the high K_2O content of the three samples indicates a necessity for further investigation.

The area of "porphyritic granite" begins about two miles northwest of Salisbury and extends northward for approximately six miles through Davie and Davidson Counties. The rock is a medium to dark gray, massive to slightly foliated porphyritic biotite granite. The phenocrysts range up to two inches in width and six inches in length.

Twenty-nine samples of this porphyritic granite were taken from Rowan, Davie, and Davidson Counties. Five samples from this area (3340, 3141, 3145, 3148, and 3362) are included in Table 3 which shows the best feldspar ores processed. These five average 10.2 percent K_2O, and a percent yield from ore ranging from 38.2 to 21.8 percent.

Sample 3370, although unique, suggests a possible source of high potash feldspar. This sample consisted of large, two to three-inch crystals of K-spar float. These crystals are perthitic and contain veinlets of quartz, random plagioclase, biotite, and sphene.

Road cuts in the-porphyritic granite area show various stages of decomposition of the granite. In extreme cases of weathering, spar crystals are left as float on the surface of the ground.

The possibility exists for locating concentrations of the coarse K-spar crystals in alluvium or terrace deposits. In addition, if the weathering depth of the porphyritic granite were uniformly constant over a large area, open pit mining of saprolite might be possible.

Further geologic evaluation of the porphyritic granite is needed, in order to determine the most likely areas of concentration.

Henderson-Whiteside Area - The Henderson gneiss and Whiteside granite gneiss are, for the purpose of this report, grouped together due to their geographic proximity.

These two units have been sampled in southern Henderson and southeastern Transylvania Counties. The Whiteside granite has also been sampled west of the Brevard Zone in Jackson, Macon, and Transylvania Counties, but as yet no data is available.

The Henderson gneiss is typically a fine to medium-grained biotite-quartz monzonite augen gneiss composed of quartz, plagioclase, potassium feldspar, biotite, muscovite and epidote, with minor chlorite, garnet and hornblende. The augen are normally composed of microcline or perthite but occasionally some plagioclase augen occur.

The Whiteside granite in the area east of the Brevard Zone is a light gray even-grained rock composed of orthoclase, plagioclase, quartz, muscovite and biotite, with minor magnetite, ilmenite, and garnet.

Geologic mapping by Livingstone and McKniff in the Cashiers-Rosman area has resulted in the division of the Whiteside into three rock units, ranging from a granitic biotite gneiss to a foliated quartz diorite.

Twenty-three samples have been obtained from this area. Two of these samples, Nos. 3187 and 3214, show high K_2O content. Sample 3187 consists of weathered Henderson gneiss and the feldspar contains 10.8 percent K_2O. Sample 3214 is weathered Whiteside granite and contains 12.6 percent K_2O. In both cases weathering of the rock has resulted in a relative increase in the K_2O content.

Further sampling in the Whiteside granite west of the Brevard Zone, and of the Henderson gneiss is in progress.

Future Investigation - Further sampling will be undertaken in the area of Dallas, Gaston County. The rock in this area is believed similar to the adamellite of York County (Butler, R. J., oral communication) and may contain high K-spar values.

In addition samples for feldspar evaluation are to be collected from the Eastern Piedmont granite area.

Samples of the Beech, Blowing Rock, Cranberry, and Max Patch granites have been collected, and depending upon results obtained, further sampling will be initiated.

Detailed geologic investigations of possible areas of concentration of K-spar phenocrysts in the porphyritic granite area of Rowan-Davie-Davidson Counties will be initiated when sampling in Areas 2 and 3 and in the Dallas area have been accomplished.

Contingent upon locating alluvial or terrace deposits in the above three-county area, a drilling program could be initiated to further define the extent of any K-spar rich zone which was found.

Table 5

Location of Samples

Area 1

Charlotte Belt

Field Sample No.	Lab Sample No.	Field Sample No.	Lab Sample No.
-	1896A	FG-37	3202
-	1896B	FG-38	3203
FG-1	3132A	FG-48	3338
FG-2	3132B	FG-49	3339
FG-3	3133A	FG-50	3340
FG-4	3133B	FG-51A	3341
FG-5	3134A	FG-51B	3342
FG-6	3134B	FG-52	3343
FG-7	3135A	FG-53	3344
FG-8	3135B	FG-54A	3345
FG-9	3136	FG-54B	3346
FG-10	3137	FG-55	3347
FG-11	3138	FG-56	3348
FG-12	3139	FG-57	3349
FG-13	3140	FG-58	3350
FG-14	3141	FG-59	3351
FG-15	3142	FG-60A	3352
FG-16	3143	FG-60B	3353
FG-17	3144	FG-61	3354
FG-18	3145	FG-62	3355
FG-19	3146	FG-63	3356
FG-20	3147	FG-64	3357
FG-21	3148	FG-65	3358
FG-22	3149	FG-66	3359
FG-23	3150	FG-67A	3360
FG-24	3157	FG-67B	3361
FG-25	3158	FG-68	3362
FG-26	3159	FG-69	3363
FG-27	3156A	FG-70	3364
FG-28	3156B	FG-71	3365
-	3179	FG-72	3366
FG-33	3199	FG-73	3367
FG-34	3200A	FG-74	3368
FG-35	3200B	FG-75	3369
FG-36	3201	FG-76	3370

Area 2

Rolesville-Wendell-Knightdale Granite

Field Sample No.	Lab Sample No.
-	3129A
-	3129B

Area 3

Henderson-Whiteside		Miscellaneous		
Field Sample No.	Lab Sample No.	Field Sample No.	Lab Sample No.	Location
-	1812	-	1942	Eastern Piedmont
-	3104			Granite Belt
FG-30	3187	-	2000	Eastern Piedmont
FG-32	3193			Granite Belt
FG-39	3209A	-	3029	Eastern Piedmont
FG-40	3209B			Granite Belt
FG-41	3210	-	3030	Eastern Piedmont
FG-42	3211			Granite Belt
FG-43	3212	-	3058	Blue Ridge Complex
FG-44	3213	-	3062	Eastern Piedmont
FG-45	3214			Granite Belt
FG-46	3215	FG-29	3186	Blue Ridge Complex
FG-47	3216	FG-31	3189	Grandfather Mountain
FG-82	3475			Window
FG-83	3476	-	3487	Spruce Pine
FG-84	3477	-		Mining District
FG-85	3478	FG-92	3493	Blue Ridge Complex
FG-86	3479			
FG-87	3480			
FG-88	3481			
FG-89	3482			
FG-90	3483			
FG-91	3484			

REFERENCES CITED

1. Butler, J. R., 1969, oral communication
2. Councill, R. J., 1954, The Commercial Granites of North Carolina: North Carolina Department of Conservation and Development Bulletin No. 67, pp. 18 & 20
3. Phillips, E. L., 1967, The Salisbury Adamellite Pluton, North Carolina: Southeastern Geology, Vol. VIII, No. 3
4. Watson, T. L. and Laney, F. B., 1906, Building and Ornamental Stones of North Carolina: North Carolina Geology and Econ. Survey, Bulletin 2, p. 95